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MILITARY LIBRARIANS
WORKSHOP**

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**USAF SCHOOL OF
AEROSPACE MEDICINE**

BROOKS AIR FORCE BASE, TEXAS

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The theme of the Thirty-Third Annual Military Librarians Workshop was Technology in Transition. The workshop, sponsored by the USAF School of Aerospace Medicine, was held at the Sheraton Gunter Hotel in downtown San Antonio. Discussion topics included Hypermedia, Local Area Networks, CD-ROM Catalogs, Emerging Technologies, and Total Quality Management.

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FOREWORD

The theme for the Thirty-Third Annual Military Librarians Workshop was "Technology in Transition." The librarian's job is to manage information. A biomedical librarian's job at the USAF School of Aerospace Medicine (USAFSAM) is to manage medical information and make it available to scientists and researchers under the pressure of time. Librarians must have modern computer systems and software at their disposal and the knowledge to use them effectively. Thus, with the assistance of the staff of the Strughold Aeromedical Library, USAFSAM scientists can introduce new and better technology to give Air Force pilots the combat edge.

For our pilots to fly higher and faster and to maneuver quicker than their rivals, it takes more than skill in handling aircraft. It takes technology to maintain the upper hand -- technology in transition.

Data is the raw material of technology. When data is analyzed, it becomes information. When information is applied in a research project to solve a technological question, it becomes knowledge. From this knowledge, a prototype can be designed, tested, and evaluated. If design, test and evaluation is successful, the prototype may be approved to proceed to the production state and, after further test and evaluation, be sent to the field. After the prototype becomes a new system or subsystem, it may be modified one or more times during its lifetime to make it more reliable. The Air Force Systems Command calls this process of research, development and acquisition the cradle-to-the-grave approach. It is technology in transition.

In a research and development organization, the technical library can help the scientist to organize a computer research for specific information. So much information has accumulated over the years that it is almost impossible to find all the available information using manual search methods, although a manual search should almost always be included in reviewing the literature. The librarian assisting the scientist must know about indexing methods for particular databases and how to take shortcuts without missing important information. Electronic bibliographic searches are not free; therefore, economy must be a consideration. There is a parallel between technology in transition in systems acquisition and that in managing information.

Technology is necessarily complex, and information management technology is no exception. It is constantly evolving through improved computer hardware and software. Central Processing Unit (CPU) memory has expanded from kilobytes to megabytes and now to gigabytes to deal with the information overload syndrome. CPU speed has increased from 4 mHz to 50 mHz and beyond. As software has become

more powerful, it has come to demand more and more memory and higher and higher operating speeds. Software scientists have made their products more intuitive, prompting the user to refer to other bibliographic headings to find specific information. Hypertext and Hypermedia use artificial intelligence (AI) in this intuitive search for information. As AI technology evolves, bibliographic searches will become more automated and more efficient through technology in transition.

As we struggle to adapt to the Information Age, we find that we have to do more with less. Managing information will become more complex, not less, because the mass of information is increasing at an alarming rate, almost logarithmically, and we must be up to the challenge of selectively searching through the morass and giving our customers what they need. It is a difficult challenge to operate in a medium where change is the norm rather than the exception, but we will find that change is manageable as is most anything, if we set our minds to the task at hand and rein-in information technology in transition to manageable levels.

HISTORY OF BROOKS AIR FORCE BASE

When the United States entered World War I, the United States Army recognized that it needed trained flying instructors. The Army wanted a year-round pilot training program and sought a site that offered a favorable climate, a good water supply, and convenient transportation facilities. San Antonio was one of many southern cities under consideration for pilot training.

After the Army selected San Antonio, the Chamber of Commerce offered the Army an 873-acre tract of land in southeast San Antonio near Berg's Mill.

Ground was broken for Kelly Field #5 on 8 December 1917; it was formally established under the command of Major Henry C. Pratt on 16 February 1918. The completed field had 16 hangars with support facilities.

Kelly Field #5 was named Brooks Field in February 1918, to honor Cadet Sidney Johnson Brooks, Jr. (1895-1917). He was the first native San Antonian to die in World War I related activities. Brooks was on his final flight training sortie when his plane crashed. Eyewitnesses reported that Brooks seemed to lose consciousness as his plane was approaching the runway preparing to land. It was said that he had been given immunizations the morning before the flight, which may have contributed to the accident. Such needless accidents led to the creation of the Medical Research Laboratory at about the same time at Hazelhurst Field, Long Island, New York. The Laboratory later became the School of Aviation Medicine.

The first mission assigned to Brooks Field was to train Army Officers as flight instructors in the Gosport system. In the simple system, developed for the British Royal Air Forces, the flight instructor gave directions to the student pilot through a speaking tube. In the Gosport system, a student remained under the same instructor throughout flying training.

The Gosport Instructor School was closed in 1919; the Army then opened a Balloon and Airship School at Brooks Field. A huge 91,000-square foot hangar was built and the new school cooperated with Camp John Wise in training pilots and ground crews to operate lighter-than-air (hydrogen-filled) craft. A series of airship accidents led to the closing of the school in 1922.

After the Balloon and Airship School closed down, Brooks Field became the Army Air Corps' Primary Flying School. Among its alumni were Claire L. Chennault, Thomas D. White, Nathan F. Twining, and Charles A. Lindbergh.

The Army recognized that the Primary Flying School was an excellent source for research in aviation medicine and so decided to transfer the School of Aviation Medicine to Brooks Field in 1926 to provide an opportunity to screen, examine, and

upgrade the quality of cadets trained at Brooks. This opportunity was not to last; both the Primary Flying School and the School of Aviation Medicine were transferred to Randolph Field in October 1931.

Several observation units were transferred to Brooks after the Primary Flying School and the School of Aviation Medicine moved to Randolph. Early in World War II, advanced pilot training began at Brooks; observation training was included in the advanced pilot training schedule after it was verified that observation training produced better pilots. Nevertheless, observation training became the province of tactical units and was discontinued at Brooks Field.

The primary mission for the Brooks Field Air Corps Advanced Flying School immediately before and during World War II was to provide advanced flying instruction in the single-engine BC-1 and AT-6 planes in acrobatics, in formation, cross-country, and instrument flying, and in ground school courses.

In August 1943, the Army Air Forces Pilot School (Advanced 2-engine) replaced the Air Corps Advanced Flying School at Brooks Field. The program of instruction included 70 hours of flying training and 60 hours of ground training plus 14 hours of code instruction. The foremost problem in the B-25 program was to maintain enough B-25s in flying condition. The sudden shift from single to twin-engine aircraft training made it necessary to retrain B-25 ground crews and flight instructors.

After the end of World War II, pilot training was discontinued at Brooks; there was a succession of tactical units at Brooks flying fighters, cargo and medical evacuation aircraft.

An era in aviation history ended on 20 June 1960, when Colonel L. B. Matthews flew the last sortie from Brooks Air Force Base in a C-131 "Samaritan."

In the early 1950s, Headquarters USAF approved a new mission and new facilities for Brooks Air Force Base. The School of Aviation Medicine at Randolph Air Force Base received a new and expanded mission and would soon move to new facilities at Brooks. The School officially opened at Brooks on 3 August 1959.

On 1 October 1959, Brooks Air Force Base became the headquarters for the new Aerospace Medical Center and the School was incorporated into the Center. The dream of a few visionary Air Force officers, notably Major Generals Harry G. Armstrong and Otis Benson, the formation of the Aerospace Medical Center became the first step in placing the management of aerospace medical research education under one command. Two years later the Aerospace Medical Division (AMD) was established at Brooks under the Air Force Systems Command; the mission of the Center was incorporated into the Division.

The creation of AMD drew together several elements that would make major contributions to the U.S. space program. The School held the first ever panel meeting

to discuss medical problems of space flight on 12 November 1948. Shortly after, in May 1949, Colonel Harry G. Armstrong, then commander of the School, created the Department of Space Medicine, and appointed Dr. Hubertus Strughold the first permanent head of the new department. Dr. Strughold was one of the German scientists who came to the United States after World War II. He became known as the Father of Space Medicine.

The School was well ahead of the rest of the Nation in preparing for space flight. It seemed to many in the scientific community that America was dragging its feet in funding space research; their fears were confirmed when the Soviet Union launched Sputnik I on 4 October 1957. Finally Congress acted to fund the space program.

One of the first successes in the space program came in December 1959 when a rhesus monkey named "SAM" (for the School of Aerospace Medicine) was launched 53 miles to the fringes of space in an AMD-developed space capsule. SAM was recovered unharmed.

NASA drew heavily on the School's expertise in space medicine. The School and the USAF Wilford Hall Medical Center at Lackland Air Force Base provided medical support to NASA for the first four orbital flights through May 1963. During that year NASA funding for AMD increased from \$187,000 to almost \$1,000,000.

On 21 November 1963, President John F. Kennedy came to dedicate the new aerospace medicine building complex on Brooks AFB. In his speech he recalled the remarks of Irish author, Frank O'Connor, who relates how, as a boy, he and his friends would make their way across the countryside, and when they came to an orchard wall that seemed too high, and too doubtful to try, and too difficult to permit their voyage to continue, they took off their caps and tossed them over the wall -- and then they had no choice but to follow them.

"This nation has tossed its cap over the wall of space -- and we have no choice but to follow it. Whatever the difficulties, they will be overcome. Whatever the hazards, they must be guarded against. With the vital help of this Aerospace Medicine Center, with the help of all those who labor in the space endeavor, with the help and support of all Americans, we will climb this wall with safety and with speed -- and we shall then explore the wonders on the other side."

The next day President Kennedy was assassinated in Dallas.

Even with the considerable human-centered resources of AMD, there was still something missing from Brooks AFB. Training psychologists and other professional specialists were needed to explore new concepts in training and in pilot selection to prepare our aircrewmembers to meet the stresses imposed by flying in supersonic and hypersonic aircraft. Aerospace technological applications presented toxic hazards in

handling exotic fuels and other materials; there was also the ever present danger of aircrew exposure in wartime to the effects of nuclear, biological, and chemical weapons being stockpiled in other nations.

The U.S. Air Force Human Resources Laboratory, a separate unit of the Air Force Systems Command, was transferred to Brooks Air Force Base on 1 July 1968. It was incorporated into AMD in 1983. The Laboratory is the principal AFSC organization for planning and executing such programs as manpower and personnel, education and training, simulation and training devices, and logistics and group aspects of human factors applications.

In 1976, the Secretary of the Air Force directed the consolidation of the Air Force's environmental and radiological health laboratory support functions into one organization. The Occupational and Environmental Health Laboratory (OEHL) was activated and assigned to AMD on 30 September 1976. The OEHL was created to centrally manage all environmental and occupational health activities which were too complex to be handled at the base level.

By streamlining its operations in 1986, AMD refocused its attention more directly on the growing human-centered acquisition mission. The Aerospace Medical Division's name was changed to the Human Systems Division to reflect its human-centered mission in four functional areas: Crew Systems Integration, Crew Protection, Force Readiness (Human Resources and Aerospace Medicine), and Environmental Protection.

The Defense Management Report issued in July 1989 mandated reform and reorganization to comply with the requirements of the Packard Commission and the Goldwater-Nichols Defense Reorganization Act. The future may look cloudy and uncertain; there may be extensive personnel and funding cuts, but the opposite may be true in human-centered research, and we may continue to grow. We have barely scratched the surface in supersonic and hypersonic flight; there is still a lot left to do.

The days of small biplanes landing on dirt runways have long passed, but the spirit of our early aviators and flight surgeons is still with us. Our military and civilian scientists and support specialists will continue to work together to make it possible for our aviators to fly faster and higher and fight smarter in defense of America's skies.

**LIBRARIES AND TECHNOLOGY
IN TRANSITION:
MEETING THE CHALLENGE**

Welcome Address

CLAY TABLETS AND MICROCHIPS

**George C. Mohr
Acting Chief Scientist
Human Systems Division (AFSC)
Brooks Air Force Base, Texas**

CLAY TABLETS AND MICROCHIPS

**George C. Mohr
Acting Chief Scientist
Human Systems Division (AFSC)
Brooks Air Force Base, Texas**

**"Superfluity of means leads to their useless expenditure."
(After Latham)**

INTRODUCTION

The richness of language sets the human apart from other species. This asset, together with a pronating thumb and an upright posture, has made it possible for the development of the technology underpinning the modern world. The origin of language is obscure; however, a Russian language scholar, V. Illic-Svityc, reconstructed a proto-proto-language called Nostratic, believed to have been spoken in the Near-East 12,000 years ago. The Nostratic School of linguists suggest that an even earlier language existed some 40,000 to 50,000 years ago, representing the primordial "mother tongue" from which all other ancient and modern languages can be traced.

By the beginning of the fifth millennium before the Christian Era (5,000 B.C.E.), the Sumerians already used a highly specialized form of writing, probably developed at least 2,000 years earlier as a collection of pictographs. Written records were produced by pressing the tip of reed stylus into a soft clay surface. The resulting "tablet" was later dried and sometimes fired in a kiln to provide a durable, permanent written record. A related form of writing invented by the ancient Egyptians before 3,000 B.C.E., hieroglyphics, employed a kind of paper made from the papyrus reed. The papyrus manuscripts were often fastened together and fashioned into rolls for easy storage. These early documents were frequently business-related tally-sheets, collections of laws and religious incantations. Perhaps the Gilgamesh Epic was one of the earliest surviving written works that could be called a "book." This story-poem was written in cuneiform script on 12 clay tablets and provides insights into the philosophy, history, mythology, and religion of ancient Babylonia. In this sense the Gilgamesh was a true book in that it preserved experiences, observations, and creative expressions of lasting value.

In the beginning, books were laboriously hand-prepared by scribes and were therefore limited to a relatively few copies retained by private individuals, temple priests, or princely houses. Even so, archaeological finds confirm that catalogued collections of books were maintained in temples and palaces hundreds of years before the Christian Era. This practice of housing collections of books in a central place led to the concept of a "Librarium" (in Latin: a place to keep books) and hence the "Library" of our modern day. By the middle of the first millennium B.C.E. several recognized libraries had already been established, including the Public Library of Athens founded by Pisistratus and the Samosian Library founded by Polycrates.

Perhaps one of the most magnificent libraries of the ancient world was the Alexandrian Library founded by Ptolemy (300 B.C.E.) which later grew to 700,000 rolls by the time of Caesar. The Library contained Greek, Persian, Hebrew and Indian manuscripts attracting the keenest scholars of the Hellenistic World.

The thirst to acquire knowledge and the need to preserve it for succeeding generations led to the creation of a continuously expanding constellation of libraries throughout the Hellenistic and Roman worlds. Just as clay tablets were replaced by papyrus rolls, the unwieldy roll gave way to the more readable codex, a series of folded leaves protected between heavy wooden covers, representing the first prototype of our modern books. Parchment was also introduced, being more pliant and durable than papyrus. Bookbinding came into being soon thereafter and was refined in the Middle Ages to a true art form. However, it was in the mid-fifteenth century following the introduction of paper with Johann Gutenberg's invention of the wooden printing press using movable metal type pieces that books became the true "mother of scholars" in virtually every corner of the civilized world.

As books and libraries began to flourish, and scholars began to congregate around them, the medieval universities of that period -- the Sorbonne in Paris, Oxford and Cambridge in England, the University of Bologna in Italy and the great German Universities at Heidelberg, Leipsig and Munich -- rapidly became dominant forces in shaping history. The ensuing age of scholasticism saw a new confidence developing in our ability to discover natural laws opening the way for legitimate scientific investigation. Initially there was a delicate balance between theology and reason, metaphysical truth and revealed truth. This balance was clearly evident in the writings of Roger Bacon in the thirteenth century, often credited with laying the foundation for the scientific revolution. Though he believed in the philosopher's stone and in astrology, he also wrote "mathematics is the key and the door of the science and the things of this world." "Science of this kind is greater because it produces greater utilities." In his Epistola de Secretis Operibus he predicted flying machines, submarines, and motor cars because he wanted practical inventions to repel the Mongol invasion of Christendom.

Since its beginnings in the Middle Ages, science and its practical application to technology have fueled a world in continuous change; sometimes enriching human aspirations, but also at times threatening its very survival. Today we have entered a new age, the Information Age, a state of affairs undreamed of by the ancient scribes tediously imprinting their cuneiform pictographs on wet slabs of aluminum silicate. By strange coincidence, silicon, the basic material used in computer microchips, is once again the substrate for preserving knowledge and perhaps even more importantly, providing an unparalleled means for cataloguing and retrieving that knowledge. Today the "Library" remains the place where books (the "mother of scholars") are found. But it is the computer that is nurturing the scholar's understanding of the unfolding mysteries of science. In the discussion that follows, we will examine one modern application of the new dimensions added by computer-managed information for advancement of science and technology.

INFORMATION ANALYSIS CENTERS

It is estimated that the world pool of knowledge is now doubling every 3 years. The three classical scientific disciplines of biology, chemistry, and physics have been subdivided, merged, and re-divided countless times to the point that we now have specialists in fields such as "mathematical quantum molecular biological chemistry." In short, scientific information is one of our most plentiful assets in modern society and at the same time presents one of our most difficult challenges to apply this rapidly evolving knowledge productively for the common good, lest we practice waste as Latham admonished. Scientists and engineers working to advance scientific understanding of the human's role in military systems have a particularly heavy burden to bear. Human Systems Science and Technology is concerned with all aspects of human behavior as individuals, in work teams, and in organizations; including the physical, physiologic, psychologic, and societal factors underlying human health, safety, performance, and interpersonal dynamics. The sum total of relevant knowledge in this area alone already pales the 700,000 rolls in Ptolemy's Alexandrian Museum. Obviously, it is impractical to expect today's scientists and engineers to absorb this monumental body of knowledge, let alone keep pace with the geometric expansion of information that continues unabated.

The Department of Defense, several years ago, undertook an innovative program to combat the heightening potential for information to "be lost" in obscure archives and therefore frequently "re-discovered" at considerable cost. The program established a series of contractor-operated, government agency-managed information analysis centers or IACs. The IACs are organized around highly specialized technical areas, employing computer-managed information strategies to collect, review, analyze, appraise, summarize, and store technical information, made available to government, industry, and private sector requesters on a fee-for-service basis. Some two dozen IACs have been formed with varying degrees of success in a wide variety of technical disciplines, including chemical propulsion, metals and ceramics, metal matrix composites, nuclear information, shock and vibration, reliability, conventional survivability and vulnerability, nondestructive testing, chemical and biological warfare, and most recently crew station ergonomics. This latest IAC, the Crew Station Ergonomics Information Analysis Center (CSERIAC) with technical support from the Human Systems Division (HSD) specifically addresses the science and technology information requirements for human-centered design of cockpits, crew stations, and ground-based workstations.

Prior studies analyzing the information environment within which crew station designers conventionally work revealed that the majority of the formal reference material used by the engineer is maintained "within easy reach" in the work place. Over 90% of the design guides, professional journals, and technical books actually used were physically archived in the designer's office area. This finding suggests that only a small part of the total "available" information pool is likely to be accessed by the designer during the design process. Furthermore, it is reasonable to assume that an even smaller portion of the most recent information being produced in research laboratories around the globe will be found on the designer's "office bookshelf." This

is one of the major, nagging problems frustrating timely and effective technology transition. The problem of information management is further compounded by the degree of specialization which has become necessary to assure that individual scientists and engineers can achieve and maintain real expertise in their chosen field. This fact-of-life in today's technologically complex world means that system design can only be accomplished by teams of engineers, each equipped with a potentially narrow and variously dated sample of available information that may be remarkably dissimilar in scope, format, or thoroughness. It is not surprising then, that mismatches, omissions, and outright errors creep into initial designs quite unrecognized until they are revealed later on by development or operational testing when remedial action is often difficult and always more costly.

It is in the above context that the CSERIAC offers a vital service that can potentially go a long way toward lessening the designer's information management problem. The master plan for the CSERIAC initiative calls for five major developments: (1) publication of a two-volume "standard" scientific reference book, the Handbook of Perception and Human Performance, (2) publication of a four-volume Engineering Data Compendium, (3) sponsorship of recurring workshops to enhance professional development of crew system engineers, (4) operation of a DOD-sponsored, HSD-hosted CSERIAC, and (5) development of an artificial intelligence-mediated Designers Associate to assist the designer with retrieval and application of design data. The principal objectives of the program are to (1) accelerate technology transfer to industry and transition to system acquisition, (2) establish a gateway to diverse information repositories and data bases relevant to crew system ergonomics, (3) develop a network among key subject matter experts, (4) implement a proactive "information marketing" effort, and (5) support an innovative document-based and computer-based information media system. There are presently a number of technology products already available through the CSERIAC, including: (1) an encyclopedic CD-ROM containing the entire Engineering Data Compendium, (2) the Crew Chief Model for maintainability design, (3) the COMBIMAN Model for anthropometric design, (4) the Subjective Workload Assessment Technique Model for analysis of automation options, (5) the Criterion Test Set for crew performance analysis, (6) a Human Performance Models Directory, (7) the Biodynamics Data Bank containing research data on acceleration bioeffects, (8) the Head-Spine Injury Prediction Model for escape system design, and (9) the Articulated Whole Body Model for support and restraint system design.

The next step is to complete development of a Designers Associate to provide an automated design support capability employing machine intelligence. The objective is to aid designers in accessing relevant data sources and to interact human performance data with system interface data required to achieve an optimal man-machine interface design. The Designers Associate will employ artificial intelligence software routines to access information from multiple sources, including design data bases, vendor data bases, test data on lessons-learned, and evolving research data. The full system will also assist the designer with question formulation, understanding the proposed solution set and making trade-off decisions. As this design-aiding technology becomes available and continues to be improved, the designer will have,

through the medium of the microchip, ready access to almost limitless information. It is not implausible to believe this may have been the principal goal of the Sumerian scribes as they pressed their reed styli into the soft clay.

THE OTHER HALF OF THE EQUATION

We have briefly examined the chronology leading to our entry into the modern Information Age, beginning with the development of human language, perhaps more than 50,000 years ago on the shores of the Mediterranean Sea, up to the modern computer revolution which is dramatically changing how we manage information. However, information management can only benefit mankind if the information being managed is derived from the rational, ordered, verifiable application of the human intellect to illuminate natural laws and adapt natural processes to achieve our aspirations. In all areas of human endeavor, the key is "quality," not just "quantity." In science this is particularly so because scientific induction and deduction are extremely complex processes with many hidden pitfalls awaiting the ill-prepared or unwary adventurer. In the current scientific environment where "advances" seem to be emerging at an unprecedented rate in nearly every discipline, there is a pervasive compulsion to seek shortcuts to good science, to draw conclusions before the data are complete, and to indulge in shallow, poorly documented, unverifiable scientific deduction. This damning charge has been directed from time to time against Department of Defense (DOD) research laboratories, in particular. Whether the charge is valid in part or in general continues to be actively debated by both supporters and critics alike. Whatever the case may be, the Human Systems Division, in concert with Air Force Systems Command and Headquarters Air Force initiatives, is pursuing a vigorous program on a broad front to enrich the quality of in-house scientific research. This program promises to have a significant impact on our library system in the future.

The Human Systems Division has made a long-term commitment in keeping with the DOD Total Quality Management program to achieve excellence in science and technology. The basic elements of the implementation plan currently under development include the following: (1) develop a network of Chief Scientists assigned full-time responsibility for excellence in each of our laboratories, (2) establish one or more Centers-of-Excellence in each laboratory, (3) establish Senior Scientist (ST) positions to attract top scientific talent to lead the Centers-of-Excellence program and provide senior technical directors in key positions in the laboratories, (4) participate in the Air Force's Palace Knight Program providing a means to recruit promising science graduates from the nation's top universities with a formally planned, government-funded, follow-on, work-education program leading to a doctoral degree within 7 years, and (5) establish an HSD Fellows Program to allow highly qualified scientists and engineers to devote themselves full-time to individual in-house research for a specified period of time, receiving all necessary resource support from the host organization. Taken as a whole, the program is intended to produce clusters of scientific excellence led by a recognized authority in the appropriate principal discipline. The demonstrated scientific productivity and excellence of the group should act as a magnet drawing senior scientists to participate through other existing

scientific enrichment programs such as the National Research Council Research Associateships, the Office of Scientific Research University Resident Research Program, and HSD Scholars Program.

The Library System needs to prepare for meeting the challenges which may be brought by this commitment to in-house research occurring across the Air Force Systems Command. The fully committed in-house scientific cadres will of necessity make new and increased demands on library resources, requesting broader technical coverage and shorter response times, including increased access to foreign literature, both in the original language and in translation. There will undoubtedly be heightened requirements for topical area search and retrieval of technical material from multiple sources including academic institutions, federal laboratories, industry sponsored research, development organizations and even operational units worldwide. Certainly the demand for the latest information management aids will grow, including computer access to library networks, CD-ROM bibliographic storage, computer access to Data Repositories and the various Information Analysis Centers discussed above. As in the days of clay tablets, the Librarium will still host the "mother of scholars" in this age of microchips.

EPILOGUE

At risk of surrendering to the "shallow science" decried in the paragraphs above, it is compelling, nonetheless, to hazard a guess about what the future has in store for the library system. Just as the Alexandrian Museum was bursting under the load of accumulated papyrus rolls at the time of its destruction by fire, the same is true of all modern libraries and the situation can only get worse with the stream of time. More and more of the world's knowledge will not be directly accessible in its original form by the user. While the computer revolution is providing a means to store an almost limitless amount of information, we need to examine how we are to retrieve, assess, and use that information, given that the sheer volume available can tax even the most receptive mind. Perhaps what is needed is a Librarians Associate patterned after the concept of the Designers Associate described in a previous section. The Librarians Associate might help the scientist define the need, identify priority sources of information, integrate and cross-reference relevant information from multiple domains, identify logical gaps in the information continuum, interpret and reformat retrieved information content, and identify ambiguities. If indeed this future becomes reality, we can be assured we will not be guilty of Latham's admonition: "Superfluity of means leads to their useless expenditure."

Keynote Address

TECHNOLOGY AND THE CHANGING ROLES OF LIBRARIANS

**Thomas W. Leonhardt
Dean of Libraries
University of the Pacific
Stockton, California**

TECHNOLOGY AND THE CHANGING ROLES OF LIBRARIANS

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It is a real pleasure to be here for several reasons. First of all, it is always a pleasure and an honor to speak to a group of colleagues. I am here, I know, because of my association with the Library and Information Technology Association's quarterly journal, Information Technology and Libraries or ITAL as we usually call it, but I feel very much at home among military librarians because I am an Army Brat who grew up using military libraries, for the most part, and because of the military background, found the transition from graduate student to librarian less painful for me than for some of the others in my class because I was already accustomed to the world of acronyms and initialisms. LC, OCLC, ALA, RTSD, LITA, SLA, and so on, hardly phased me; I grew up with C.O., EXO, NCO, MOS, and AWOL. There are many others, to be sure, but you get the point.

Those memories of Army post days remind me of the second reason I am honored to be here. I grew up using Army post libraries and I am forever indebted to those libraries and their librarians; you among them carrying on their heritage. My story is no different from those stories of many other Americans who found a home away from home in the library, be it a post library, a Carnegie library, or something as grand as the New York Public Library. I remember the Camp Stoneman Post Library with extra affection because it is the first library I ever used and its use is mixed with some fond boyhood memories of a time when young men were being processed at Camp Stoneman en route to Korea. When I used the post libraries at Fort Bragg, Fort Benning, and Fulda as a GI, I remembered that library at Camp Stoneman and the one in Big Delta, Territory of Alaska, and realized how lucky I had been.

Finally, I am honored to be here as a keynote speaker to talk about two subjects that I care a great deal about, especially in tandem--librarianship and technology. It is a very powerful combination, still much misunderstood and underutilized. Some of us old dogs are willing and able to learn new tricks, and I worry about those who do not believe it is so or who just don't care for a variety of reasons. As a matter of fact, many of the leaders in the field were not spring chickens when they began to advocate the use of computers in libraries. They were publicly hooted at by many during those times, but the pioneers stayed long enough to see their dreams come true and we now take for granted OCLC, the MARC record, and computer terminals in place of card catalogs. Fred Kilgour, who gave us OCLC and a vision, and Henriette Avram, who gave us MARC and a vision that helped make OCLC the success it is today, have been recognized for their contributions. They have made doubly sure that technology will continue to change the role of the librarian, whatever that might mean.

I have digressed far enough and long enough. Let's get serious now and use a big word to get us in the right mood. The word for today is paradigm. Kaye Gapen, University Librarian at the University of Wisconsin-Madison, writes, "Just what is a paradigm? In the sense it is used here it is a framework of thought, a scheme for understanding and explaining certain aspects of reality. Paradigms shift when a distinctively new way of thinking about old problems is developed."¹ She goes on to say that "The new thing on our horizon is electronic information. It requires of us a new paradigm, not because it is new, but because it has some essential characteristics with which we must deal that differ from anything we have dealt with up to this point."²

Recently I was in Washington, D.C. As usual when I am there and can squeeze in even an hour or so, I visit one of the Smithsonian museums. I was in the Museum of American History this last visit and, knowing that I was going to be speaking to this group, I was particularly interested in the exhibits about life in Colonial America and in the exhibit entitled "It's a Material World" or something like that. The title of that exhibit can be taken two ways and I think the way you take it at the moment may depend on the mood you are in at the time, or it may depend on your reference to the world around you. That particular weekend thousands of people were marching on the Mall in Washington to plead for more housing for the poor and the homeless. The exhibit looked very material indeed, but humanity is obviously material by nature so I am not, in any way, apologizing for the things we have invented, partly out of need, partly out of playfulness.

In the Smithsonian exhibit there are examples of televisions, radios, telephones, weapons, and you name it. There are complete kitchens set up as they would have been in the 1930s and 1940s, quite accurately if I am to believe a retirement-aged couple I overheard remarking on the fidelity to what they remembered with some affection. Everything in that kitchen, including the table, seemed quaint and of doll-house proportions, almost. The young people looking at the exhibit may not have realized that the ice box was just that and did not run on electricity. Did anyone using an ice box, even knowing about the refrigerator, envision a modern model that supplies ice cubes and water and tells you that you have left the door open?

These young people may not have realized that the stove was fueled by coal or wood, and only later was converted to run on oil and then on gas or electricity. Did anyone from the days of the woodstove or even the early electric range envision the microwave oven and the related industry that would grow up around it? Popcorn and TV dinners have come a long way since radar ranges became inexpensive and commonplace.

Those changes were gradual at first and then were quite sudden, just as the telefacsimile machine and the cellular telephone went from being exotic and expensive business tools to becoming overnight necessities for libraries, travelling sales representatives, and even commuters who don't want to be all alone on the highway when traffic jams up.

The change in how database services are used and who uses them has also snuck up on us in the same way. Online services are offered now by several companies and allow users not only to look up citations to books and journals but to buy merchandise, check stocks and bonds, consult the Official Airline Guide, look at the wire services, and so on. Flexible pricing is now available so that almost anyone can afford to use some of these databases, once the investment in a microcomputer, modem, and software has been made.

For many reasons, I grew up without television for all but about two and a half years of my childhood. First of all, it was not widespread in the 1940s and early 1950s, and second of all, there was no television in Alaska in 1953 and from 1958-1961 when we were in West Germany there were no American television programs. Besides, there was still great Armed Forces Radio into the early 1960s, so who needed television.

I still marvel sometimes that there is such a thing as television. I don't feel the same way about radio because I grew up with radio and just took it for granted. It was always there and always at my disposal. I realize, though, that there are still people alive who grew up before radio and when radio was in its infancy and for whom radio was never such a natural thing. I guess that is how I feel about television. Although I enjoy it, it does not seem natural, and I can still get more out of a radio broadcast of a baseball game than I can out of a television broadcast of the same sport because I grew up listening to baseball games, and in the early 1950s, radio games were superior to television games.

The point is that communication and entertainment, during this century not yet over, have changed so incredibly and so quickly, that we still haven't fully grasped the consequences, with all due apologies to Marshall McLuhan. But his "The medium is the message" strikes me as an accurate thing to say because it is such an ambiguous and yet true statement that we are becoming more and more aware of, even as we forget who Marshall McLuhan is. Remember the TV show Laugh-In asking "Marshall McLuhan, what are you doin'?" The medium is the message is maybe what our watchword, our keyword, our key chord ought to be as librarians. Perhaps we ought to keep that thought each and every day as we go about our business and as we work with those who come to the library or call the library asking for one medium or another.

My children and millions of others have grown up taking television for granted and see nothing particularly miraculous about seeing their favorite movies on videocassette. It is there and has always been there. Also, they have grown up in an era of such rapid technological development that change is normal and expected and not fast enough to keep up with what they want. The more technological toys we are given, the more we want and the more sophistication we want and are ready for, whether we know we want it or not. As an example, my kids were quite content to play Nintendo on the family television. Occasionally there were conflicts when they wanted to play while someone else wanted to watch something on the cable network. Nintendo, in a stroke of genius, has solved that problem and, incidentally, opened the door for yet more profits with its laptop Nintendo system called "Game Boy." Following

the example set by the microcomputer, this laptop game system (really a computer after all) uses smaller cassettes and runs on either alternating current or batteries.

The point I am trying to make is that library users, not just potential users, are technologically sophisticated. I don't think they are information sophisticated or knowledgeable, *not yet*, but the technology is assumed and taken for granted. I asked my daughter how she knew how to play a new Nintendo game without instructions and she said, "Dad, we're kids; we know these things." Out of the mouths of babes.

When I first began to write this paper, I thought it would be easy because in my own library we are talking about how to use the current technology in ways that will *improve our performance and that will improve the services we offer our users*. As I began reading and preparing to write, I realized how many different areas there are to be covered, any one of which could fill an entire conference agenda.

As examples, here is the list of interest groups within the American Library Association's Library Information Technology Association (LITA):

- Artificial Intelligence/Expert Systems
- Authority Control in the Online Environment
- Customized Applications for Library Microcomputers
- Desktop Publishing
- Distributed Systems
- Electronic Mail/Electronic Bulletin Boards
- Emerging Technologies
- Human/Machine Interface
- Hypertext
- Imagineering
- Innovative Microcataloging
- Library Consortia Automated Systems
- Microcomputer Users
- Online Catalogs
- Optical Information Systems
- Programmer/Analyst
- Retrospective Conversion
- Serials Automation
- Telecommunications
- Vendor/User
- Video and Cable Utilization

This is an awfully long list that is being added to every day. As a public librarian said to me when visiting the LITA booth in Dallas, "It used to be that LITA (formerly the Library Automation Division) was just for really technical people, but now it seems that almost everything that is done in public libraries relates to LITA in one way or another."

I believe that this list also shows that we may be in the final stage of the three stages that Dilys Morris described in an article called "Electronic Information and

Technology: Impact and Potential for Academic Libraries." I think her article is worth reading and taking to heart no matter what kind of library you are in because what she says is a true reflection of what is going on in American society today.

"The adoption of technology by society is generally divided into three stages. In the first, we continue to do familiar and traditional things we have always done, but we do them better and faster. In other words, we mechanize. During the second stage, the tasks themselves change because technology has revised what we do, and things are done that were never done before. Finally, in the last stage, technology causes our society itself to change, and fundamental changes in life-styles and institutions occur."³ Based on observations of my own children and their friends, I am convinced that we librarians need to recognize that we are in the third stage and need to modify our thinking about library services.

Morris goes on to talk about the need for change. She exhorts us to focus on these issues about technology and libraries and urges us to explain them to library users and funding agencies. "If the experts are correct about the impact of information and technology on our society [substitute here librarians or librarianship and the message is even more pointed to us], we must be prepared either to change or otherwise accept a steadily diminishing role. This does not mean that printed books, serials, and other traditional library materials will not be important tools for our society. It does mean that electronic information will become as important. If librarians do not incorporate electronic access to information, a substantial number of current users will obtain their information from other sources. It also means that the expanding information age will require new roles for librarians and that we must begin to anticipate these and to plan for our changing future."⁴

You have heard from one expert and will be hearing from others about specific information technologies. There are some truly exciting things going on and even small libraries can afford to climb aboard the bandwagon now that powerful micro-computers and software packages are available for all sizes of budgets. We have the tools, but do we have the imagination and do we recognize the changes that have occurred to our users, especially the younger users?

Mick O'Leary, interviewed Anne Caputo for ONLINE magazine. Caputo is the Manager of the Classroom Instruction Program at DIALOG. She explained to him that online searching in school is no longer an experiment:

There are at least a half-dozen states that have mandated knowledge of databases and online searching in the curriculum."⁵

Caputo estimates that the school programs that she is involved in reach over 400,000 kids a year.⁶ These are not college kids; these are elementary and secondary school pupils, young people who find computers exciting, interesting, nonthreatening. These are children who may or may not be comfortable with books, but may be more

so if the computer tells them about a book, just as some television shows tease the young watchers with just enough of a story to make them want to get the book and find out for themselves just how it ends.

"Caputo predicts that Classmate's [Classmate is the name of DIALOG's school program] graduates will make their presence felt throughout the information trade. She warns online searchers, especially academic librarians, that, 'You had better be prepared' for students who want to do it themselves. Public libraries, whether online are not, are also affected..."⁷

We need to be aware of the changes in technology and attitudes and change, too, not just by adopting, at face value, online public access catalogs and circulation systems, microcomputers, CD ROM, and so on. We must embrace new technology as a means, a continually changing means of serving our users and making our libraries acceptable and comfortable to all who need information, stimulation, education, and refuge.

We do need the paradigm that Kaye Gapen calls for, a new way of thinking about how we deliver information even if it means not delivering information directly, as an intermediary, but as someone who understands electronic information retrieval and can provide service to those who need it or who choose not to retrieve it on their own. We need to understand, too, that information isn't just the printed word. The Compton's Encyclopedia on CD-ROM, offering text, sound, and motion all in one integrated format, is just a portent of things yet to come. This is a real break from what we've done--we are moving away from Gutenberg who, in using printing, a new technology, tried to copy as closely as possible the manuscript hand that had been traditional. We must not censor the new approaches to information retrieval and library services, and we must not turn away from the real needs of this truly electronic generation--the wired, visual, 21st-Century generation.

Let's do our best to move beyond the mechanical stage. We know we can provide an electronic catalog (D. Morris's Stage One), and we know how to maintain that catalog and integrate indexes and library floor plans, and miscellaneous information with the records of books and journals (Stage Two), but are we really ready to change our institutions and life styles (Stage Three)? We should be advocating, for example, the removal of hard copy indexes and abstracts and other reference tools that might better serve us all in another medium, atlases, for example, on multimedia compact disc. I know it won't happen overnight, but it should happen at our urging and with our blessing. We ought not to be caught off guard when it happens; we ought to be on guard and avant garde.

Libraries have always played an educational role in this country, a much greater educational role than is played by libraries anywhere else in the world. As someone recently said, "Information technology is more than computers. But computers are the driving force today, especially for integrated media." As you learn more about

hypermedia, CD-ROM, and emerging technologies, think about the ice box and the coal stove and what happened to them. Then think of the card catalog and the hard copy encyclopedia and what has happened to them. Where else can we go?

Think, too, of eight-year-old kids seeking a haven, a place where they can live and learn vicariously, away from home and school but in a haven where learning (and information is nothing if it is not part of learning) is important and the sky's the limit. The Children of Today--well, you know how important they are. We cannot limit them with our own limitations. We can remove ourselves from the equation, however, and lose many whom we could serve. Books and magazines are going to stay for a good, long while, but our kids and young adults and mature adults, too, can find coziness and security and a knowledge haven in the warm glow of a cathode ray tube.

"Technology and the Changing Roles of Librarians" is a title, not a fact. Our roles really aren't changing and they shouldn't. But in the words of Bob Dylan, "the times they are a changin'." Let's change with them in attitude and vision, not in role.

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HYPERMEDIA: INTERFACING IN THE INFORMATION AGE

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HYPERMEDIA: INTERFACING IN THE INFORMATION AGE

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This paper is an overview of a set of technologies which may be lumped together under the term *hypermedia*. I will use the term to include technologies which are discussed under the labels hypertext, hypermedia, and virtual worlds. The common denominator of these technologies is that they involve the use of computers and powerful software to store, access, manage, and disseminate information rapidly and intuitively. By *intuitively*, I mean that the interface which allows users to work with information must be not only powerful but also easy to use. I begin with a brief history of hypertext, the predecessor to hypermedia.

It is sometimes the case that important ideas predate appropriate technologies to implement the ideas. For example, Leonardo Da Vinci's helicopter design was unworkable primarily because of the lack of a sufficiently powerful engine. Similarly, Queredo, a Spanish inventor in the early 1900s presaged modern artificial intelligence when he designed and built a machine that could play a simple chess end-game. Queredo was limited by the technology of his day. The device was mechanical and thus too unwieldy to support more complex applications. Serious work in AI required the invention of digital computers in the 1950s.

Vannevar Bush was an American scientist who constructed analog computers at Massachusetts Institute of Technology (MIT) in the 1930s. During WWII he directed the Office of Research and Development, with oversight of 6,000 U.S. scientists. The Manhattan Project (the first atomic bomb) and Eniac (the first digital computer) were two monumental projects he oversaw. In 1945, Bush published an article in the *Atlantic Monthly* entitled *As We May Think*. He pointed out that science depends on a record of knowledge, and that progress in science depends on dissemination of that knowledge. Even in 1945, the size of that record threatened our ability to make use of the record. As an example of the importance of knowledge dissemination, Bush noted that Mendel's concept of genetics was lost for a generation because the publication did not reach the few who were capable of understanding and extending it.

"The real heart of the matter...goes deeper than a lag in the adoption of mechanisms by libraries, or a lack of development of devices for their use. Our ineptitude at getting at the record is largely caused by the artificiality of systems of indexing...The human mind does not work alphabetically or numerically...It operates by association...in accordance with some intricate web of trails carried by the cells of the brain." (Bush, *As We May Think*, 1945)

Bush's article provided the basic concept underlying modern hypertext systems with his "memex, ...a tool that provides access to a large collection of microfilm and mechanisms to make links between any two pieces of information in the system." The

device was never built. Although theoretically plausible, it would have been slow, expensive, and susceptible to mechanical breakdowns. The concept, however, now present in the scientific record, was later picked up by another free-thinking individual, Ted Nelson.

In 1965 Ted Nelson defined hypertext as "a combination of natural language text with the computer's capacity for interactive branching, or dynamic display...of a non-linear text...which cannot be printed conveniently on a conventional page" (Conklin, 1987). In the late 1960s, Nelson led a project at Brown University to prototype the first hypertext system. Brown University continues to be a leader in developing hypertext as an educational tool.

To understand the concept of hypertext, consider the following, scenario. As a reader of this article, you may find yourself intrigued by the ideas of Vannevar Bush. In fact, you might like to read his original article. To do so, it would be necessary for you to get up from wherever you are now and go locate a certain 1945 issue of *Atlantic Monthly*. If, on the other hand, you were reading this article on a computer screen, and the article was a hypertext article, then you would only need to place the cursor on (Bush, *As We May Think*, 1945) at the end of the above quote, press the *enter* key, and you could read Bush's entire article. While reading Bush's article, you might find yet another reference in his article that interested you. If so, you could repeat the above procedure, and so on until you chose to return to the original article (this article). In this manner, hypertext allows one to move in a nonlinear fashion through a set of related electronic documents.

Hypermedia is the extension of this interactive branching approach to additional media besides text and graphics, including film, animation, audio recordings, spreadsheets, digitized facsimiles, and so on. Hypermedia, like hypertext, is presented in two-dimensional format on standard computer screens. Another related technology, however, is blossoming into three dimensions.

Computer graphics and interface technologies have evolved to the point where we now have the capability to create interactive virtual worlds. Virtual worlds are three-dimensional, graphical representations of physical environments. They are typically generated by producing separate and slightly offset images on small cathode ray tubes (CRTs) which are helmet-mounted and placed directly over the eyes. They use exactly the same principle as a "stereoscope" to create a 3-D effect. The helmet is then tracked by an external sensing device (usually magnetic) which allows the system to know where the subject's head is facing. As the subject's head turns, the system updates the two graphic displays to depict what the subject should be seeing from the current orientation. Thus, the subject can "look around" in the virtual world in the same way that one can look around in the physical world.

In an interactive virtual world, subjects wear gloves usually referred to as data gloves. The locations of these gloves are tracked in the same way as the orientation of the helmet is tracked. Thus, the subject can "reach into" the virtual world and effect

changes in much the same way as one may use a touchscreen or a mouse to effect changes in a traditional computer interface.

Following is a description of an interactive virtual world simulation of an aircraft maintenance shop. In this application, the simulation is intended for training purposes.

Suppose that you walk into a room that is completely empty except for a chair, a helmet, and a pair of gloves. You sit down in the chair, put the helmet and gloves on, and adjust the two eyepieces to comfortably cover your eyes. You are no longer seeing the empty room that you are sitting in. Instead, you are seeing an avionics intermediate shop. Surrounding you are the four large cabinets which make up the 6883 automatic test equipment. To your left, nearly behind you is a table, and on the table is an F-111 line replaceable unit (LRU) with a tag indicating that the LRU has malfunctioned and the nature of the malfunction. You reach out to pick up the LRU. As you reach, you see graphical representations of your arms and hands reaching into the virtual world. You pick up the LRU, turn and place it on the test equipment, and begin configuring the test equipment appropriately for the current LRU. You accomplish this task by turning dials, flipping switches, and connecting wires.

The National Aeronautics and Space Administration (NASA) has already built two prototype systems. One is a Man Maneuvering Unit (MMU) simulator. The MMU is a backpack worn by astronauts to move around in space, outside of the shuttle. The other NASA prototype is a robot arm simulator. The robot arm is a device used by astronauts to move cargo into and out of the shuttle cargo bay when in space.

It is currently expensive to acquire the hardware and write the software which create hypermedia and virtual world systems. However, hardware prices for even these sophisticated capabilities are plummeting almost daily. Furthermore, software development expenses are being reduced by the creation of software tools which ease the authoring process. The personal computers of the 21st century will include these capabilities as standard equipment.

WORKSHOPS: TECHNOLOGY INTERFACES

LOCAL AREA NETWORKS

INTRODUCTION TO LOCAL AREA NETWORKS

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**LOCAL AREA NETWORKS AND INTEGRATED LIBRARY
SYSTEMS**

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THE JOYS OF PUBLIC ACCESS MICROCOMPUTER LANS

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INTRODUCTION TO LOCAL AREA NETWORKS

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Advances in microelectronics triggered the growth of computer-based systems and the need for Local Area Networks, or LANs, to facilitate sharing peripherals within an organization. Libraries are using LANs to support a variety of applications, including circulation control, word processing, cataloging, OPAC display, acquisitions, electronic mail, file transfer, and networking CD-ROMs.

Standards for LANs have been developed by a committee of the Institute for Electrical and Electronic Engineers, known as the IEEE 802 committee. The LAN is geographically limited. LANs are oriented toward single buildings or campus-like environments, where the space between network stations is freely accessible to the network's operator. Maximum distances between user devices may range from several hundred feet to 30 miles.

The physical layout of the LAN, or topology, is integrated through the interconnection by a continuous structural medium. Multiple services may operate on a single set of cables. Both the Token-Ring and Ethernet approaches for LANs are based on multivendor standards and are supported by a variety of hardware and software. Above the basic packet-transmission protocols, one commonly finds one of a few approaches: a closed, proprietary protocol network such as Novell; a local area network integrated into a larger institutional or corporate networking context via a vendor protocol like IBM's SNA or Digital's DECNET; or LANs that participate in the national research internet through the TCP/IP protocols.

The LAN is supportive of both low-speed and high-speed data communications. The data transfer rates on LANs are high enough to satisfy most requirements and provide sufficient capacity to permit large numbers of devices to share the networks. LANs are not subject to speed limitations imposed by traditional common carrier facilities.

Although LAN sales have dramatically increased, many potential users are delaying acquisition of a LAN because of confusion over network benefits, applications, and standards. A LAN symbolizes a sizable dollar investment initially and therefore should be capable of expanding with computer applications. A LAN should either increase productivity or resolve a problem, or otherwise enhance the library's operation. However, the library's individual situation, including its size, experience with data communications, and the complexity of its information systems, should determine whether a LAN is installed. Strategies for exploiting computer and communications technology for quality service should be well thought out.

LOCAL AREA NETWORKS AND INTEGRATED LIBRARY SYSTEMS

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In 1983, the Briscoe Library moved into a new building and purchased a PDP1144 computer system. The Library was one of the first three remote sites on campus to be connected by Ethernet. From 1983 until 1987, we maintained the Georgetown University Library Information System on our inhouse library computer. The LIS system integrated an online catalog, circulation, acquisitions, and serials control system. It also contained miniMEDLINE, a local database with citation to articles for a limited number of journals indexed on MEDLINE.

In 1986, there were developments in LIS, in State funding opportunities and in our networking environment that resulted in a significant expansion of our local library computer system. First, Georgetown University announced that it had developed a multiple library version of their software. At the same time the State of Texas was funding Library automation projects from the Permanent University Funds. We received a PUF grant to purchase a VAX 8700 and share LIS with other Texas and San Antonio libraries. The Library computer is a node on the statewide network and can be reached from any terminal on the State network. BLIS is now highly visible throughout the State, and on a regular basis is searched by libraries in San Antonio, Austin, Tyler, Houston, and other Texas cities. Users go through gateways to our multiple library system and union catalog, the miniMEDLINE system, the Computerized Clinical Information System and a Library Announcements component that lists library hours, telephone numbers, instructional classes, and special events and microcomputer communication aids.

In summary, the external networks providing the means for accessing BLIS are the Texas Higher Education network, the San Antonio Technical Information network, and the Campus Ethernet network. Over the past 2 years, we have integrated stand-alone microcomputers into staff activities such as word processing, spreadsheets, graphics, database management packages and terminal emulation accessing BLIS and remote databases. Last summer, we decided to investigate what networking software would best fit our requirements. We needed a network that took advantage of the strengths of the Macintosh, but could accommodate the few IBM compatibles in staff offices. We also wanted a bridge to Ethernet so that the staff could get to Ethernet and connect either to BLIS or search remote databases from their offices. We purchased Appleshare software and will be installing the network in January 1990.

THE JOYS OF PUBLIC ACCESS MICROCOMPUTER LANS

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The experiences related in this section refer to a public access microcomputer lab with a LAN, the Teaching Learning Center (TLC), the audiovisual and microcomputer area of the Briscoe Library at the University of Texas Health Science Center at San Antonio. The purpose of the lab is to furnish equipment, software, and service to utilize and enhance computer-based instruction at the Health Science Center and to furnish an area for faculty, staff, and student use of microcomputers in general, to enhance computer literacy. Annual use figures range from 9,000 to over 11,000 microcomputer users.

The lab began in 1981 with three Apple II Plus computers and continued to flourish with different educational projects, including an interactive video tape project. In 1988, the student government association funded a laser printer network. The objectives for the LAN included: access to a laser printer by both IBM PC and Apple Macintoshes, sharing files, ease of network administration, ease of use, and expandability.

Security was of minimal concern because the network would not be used for confidential matters. However, we should have paid more attention to this issue in the systems analysis. Some of the security problems we were to encounter were: how to keep users from trashing files, from loading additional command files causing problems with other software, from loading personal software and not removing it, and from deleting needed files, etc. And then came viruses. We experienced Scores, nVIR, and Sneak. Right now, we are using Virex 2.12 which has satisfactorily handled our problems with viruses by checking each disk as it is inserted. We also check the file server daily.

Our network began with TOPS which was the recommended solution at the time, as it worked with both IBM's and Macintoshes. A few months after this decision, Appleshare was on the market with another solution for networking IBM's and Macintoshes. Appleshare was subsequently tested and is seen as the networking solution for the future of the lab primarily because of its expandability and ease of management and use.

Additional issues and concerns for a public access LAN include ease of use and/or user assistance. A great deal of staff time is spent assisting users with their problems. Staff training is obviously an issue, as your staff must train the inexperienced users and help experienced users troubleshoot. Although formal training of the network manager is advisable, you can train through experience alone. All the staff

must have some familiarity with the network. We use checklists and a handbook for evening weekend staff.

Software copyright is another issue. With a network, you can often have only one copy of an application on the server, but it is generally accepted that you will need original copies or a network or site license for every microcomputer on your network. To protect the library from unauthorized copying, we place a sign at the TLC desk and in the carrels stating that these materials are protected by the copyright-law and unauthorized duplication is not allowed.

Upgrades to hardware and software can cause a great number of headaches and problems with budgets. High quality hardware demands high quality software. With networking it may be necessary to purchase newer versions of software to avoid incompatibility problems. Older versions may not match features of the network software.

Careful planning for a LAN helps prevent mistakes, but when you have a public access LAN, you lose some control. New situations and new solutions are always appearing. Plan as carefully as you can, but expect the unexpected.

WORKSHOPS: TECHNOLOGY INTERFACES

**SCIENTIFIC AND TECHNICAL INFORMATION LIBRARY
AUTOMATION SYSTEM**

**DISTRIBUTED INFORMATION ACCESS:
RETRIEVAL DATABASE INTERFACE MANAGEMENT**

**James J. Young, President
Ann P. Tinker**

**Sirsi Corporation
Huntsville, Alabama**

DISTRIBUTED INFORMATION ACCESS: RETRIEVAL DATABASE INTERFACE MANAGEMENT

**James J. Young, President
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ABSTRACT: Sirsi's Retrieval Interface Manager (RIM) module allows researchers to efficiently search online multiple, disparate retrieval databases through a common intelligent interface which allows for uploading and downloading of data. The Retrieval Interface Manager overcomes the barriers of incompatible machines, languages, and data formats.

In recent years there has been a tremendous interest in information sharing using computers. This has taken the form of networks, CD-ROMs, and Open System Interface Standards, among others. One of the more visionary experiments is taking place at Bell Labs. The original developers of UNIX are working on an operating system called PLAN9 which would link all computers together as if they were one.

But that's the future... What about now? How can the multitude of information sources be accessed efficiently? The integration of information sources must begin at home. Local information sources must be properly organized and made accessible. Once a methodology has been established, this same access methodology can be layered on to a remote database to provide the appearance and convenience of integration.

Traditionally, automated library systems have concentrated on circulation functions. Even those systems that offer online public catalogs often provide no more than an electronic version of the traditional card catalog. To meet the current demands of users, any online catalog, whether inhouse, in a special research library downtown, or in a state library in another city, ought to be able to be seen as an information resource, a retrieval database, not merely a locating tool. Ideally, then, any library automation system could be used as an information system, rather than an automated card catalog.

Sirsi has taken this first step toward providing an inhouse information system through library automation. Sirsi has developed the STILAS online catalog that, while meeting the requirements of online public access catalogs, goes far beyond traditional automated card catalog and, in fact, is a true retrieval database.

The contents of the STILAS catalog database may also go far beyond the traditional card catalog descriptions for monographs, serials, etc. The STILAS catalog database may also contain descriptions or the full text of contracts, conference

announcements, technical reports, and research bulletins in special formats designed by the library.

Sirsi's STILAS catalog database can look just like an electronic card catalog; it offers powerful full text searching using Boolean and proximity operators on any word in any record. Beyond that, STILAS offers real retrieval database capabilities. Users can do full text searching, save search strategies, review their search history, combine several saved search strategies into new searches, and download records from the database.

The same access accorded to the STILAS catalog can, as a natural consequence, be extended to separate databases mounted on the local STILAS host computer, side by side with the STILAS catalog, which may be searched by users as additional retrieval databases in the STILAS information system. Some local databases may be customized reference databases created by researchers as they download records from various information sources and upload the records into their personal database.

Remote retrieval databases may be accessed through the same interface as the STILAS catalog and locally mounted databases, whether the remote database is in the same town, the next state, or another country. All the same searching, saving, and downloading features available to a user in the STILAS catalog are available when a user is connected to local and remote retrieval databases.

Sirsi's Retrieval Interface Manager, or RIM, provides an efficient and transparent interface to online retrieval systems for research staff and librarians, without distinguishing between internal STILAS catalog, locally mounted databases, and remote retrieval databases. In the absence of uniform defined interfaces, a la OSI, the RIM must be customized for each retrieval system its users wish to access. A targeted retrieval systems' interface is analyzed, and an interpreter is built for the RIM. The custom interpreter translates user common language RIM commands into the commands of the targeted retrieval system. Correspondingly, the interpreter translates the retrieval systems' responses (messages, statistics, data displays) into general purpose data for the RIM, which in turn, formats the information into the common data displays.

How the RIM works

Users have link files defined on the host computer through the RIM. Each link describes how RIM can connect to a particular database on each retrieval system. A user link file can be customized by the user with defaults and standards desired, a date to purge the link file, and permission for other users to use or copy the link.

A user creates connections to remote retrieval databases through modems, networks, or other telecommunication devices, one for each remote host, that the user wishes to search simultaneously. The RIM automatically picks the communications

path and establishes the connection. After establishing the connection(s), the user can search all the connected databases. To facilitate searching and displaying data from multiple heterogeneous databases, RIM has a common set of names for the fields in all of the databases which have been established at your site. RIM also has common commands for searching. Each search strategy is called a query; the result of a search is a retrieval set.

Queries may be prepared offline and used and combined to search databases once online, or each search strategy may be saved in a query typed directly online. Each query has a system-assigned name, but can be renamed and saved permanently by the user who created it. When a user issues a search, either by calling up a saved query or by typing directly into search fields, the search strategy and its results are automatically stored in a query.

The results of each query can be stored in a retrieval set, or can simply be displayed at the user's workstation. At any time, the user can review and reuse the queries issued in the current session or saved from previous sessions.

If a retrieval set was saved, the records in that set can be reviewed, edited, merged with another set, printed, sorted, or uploaded into any linked database, including the database that the set came from. Every set can have a 1- to 60-character description normally used to remind the user of the information that is contained in the set. Each record in a set can be displayed with all or some of its common field names and the contents of the record. When a record is retrieved from a link and saved in a set, the record was obtained from a link as the result of a query. The link and query become part of the record identification. Each record in a set is in the format of a particular link, and a status field is used by STILAS to indicate information about a record in a set, such as if a translation was unsuccessful, or if a record has been successfully uploaded to a database.

SAMPLE RIM SESSION SEARCHING DROLS AND DIALOG

Searching Linked Databases

The user tells RIM to connect to the DROLSTR and DIALOG NTIS remote databases. Using the available telecommunications equipment, RIM connects the user via the DROLS and NTIS link files. The user may now simultaneously search both databases with the SEARCH LINK command. In Figure 1, the user is searching both databases for items with the words "Titanium", "Titanium Alloy" or "Titanium Alloys" in the title and the descriptor "Fracture Mechanics".

```
command:SEARCH LINK

general:
author:  AND title:TITANIUM OR (TITANIUM AND ALLOY$) AND subject:  AND desc
iptor:'FRACTURE MECHANICS'
set ID:      query ID:1
DROLS   hc:    SEARCHING      w:Y d:Y s:N  display:  sort:  record:1-5
NTIS    hc:    SF'RCHING      w:Y d:Y s:N  display:  sort:  record:1-5
```

Figure 1.

This user's NTIS and DROLS links have been set to automatically display the accession number, corporate author and title fields for the first 5 citations found in the connected databases. In Figure 2, the user is viewing the brief citations retrieved from the databases.

```
command:SEARCH LINK                                     SCREEN 1 (MORE)

general:
author:  AND title:TITANIUM OR (TITANIUM AND ALLOY$) AND subject:  AND desc
iptor:'FRACTURE MECHANICS'
set ID:      query ID:1
DROLS   hc:9   TRANSFERRED:5   w:Y d:Y s:N  fields:  sort:  record:1-5
NTIS    hc:15  TRANSFERRED:5   w:Y d:Y s:N  fields:  sort:  record:1-5
-----
DROLS (1)
Accession number:AD-a030 795
Corporate author:cincinnati univ ohio
Title:Comparison of Processing Properties and Product Properties
of Beta III Titanium Alloy Power Metal (PM) and Ingot Metal (IM)
DROLS (2)
Accession number:AD-a954 804
Corporate author:carnegie inst of tech pittsburgh pa dept of civil engineeri
ng
Title:Torsion, Pre-Strain and the Fatigue Life of RC-55 Titanium
Alloy,
NTIS (1)
Accession number:AD-a007 224
Corporate author:mechanical technology inc latham n y
Title:Acoustic Emission Detection of Fatigue Crack Initiation and
Propagation in Notched and Unnotched Titanium Specimens
```

Figure 2.

From viewing select brief entries, the user can change to viewing "ALL" fields of a particular hit. In Figure 3, the user has selected to view the full record for NTIS citation (1).

```

command:SEARCH LINK                                SCREEN 1 (MORE)

general:
author:  AND title:TITANIUM OR (TITANIUM AND ALLOY$) AND subject:  AND descr
iptor:'FRACTURE MECHANICS'
set ID:          query ID:1
DROLS   hc:9     IDLE           w:Y d:N s:N  fields:  sort:  record:1-5
NTIS    hc:15    TRANSFERRED:1  w:Y d:Y s:N  fields:ALL sort:  record:1
-----
NTIS (1)
  original source:NTIS@AMTD
  current source:NTIS@AMTD
  Fields/Groups:11/06/00
Entry Classific.:U
  Prices:NTIS Prices:HC$04.25 MF$02.25
Corporate author:mechanical technology inc latham n y
  Title:Acoustic Emission Detection of Fatigue Crack Initiation and
Propagation in Notched and Unnotched Titanium Specimens
  Title Class:U
  Author(s):Darlow, M. S.;Shinaishin, O. A.;Aquaviva, S. J.
  Report Date:750100
  Pagination:68
Report Number(s):MTI-75TR18
Contract number:DAAG46-74-C-015
Project Number:AMMRC-CTR-75-1

```

Figure 3.

Saving Records in a Set

While using the SEARCH LINK command, any record may be marked to be saved. Capturing records is simply a matter of identifying a set name to be associated with the record(s) and making sure that the SAVE flag (s:) is a Y. In Figure 4, the user has selected all NTIS hits and DROLS hits 1-4 to be saved in a set called ALLOYS.

```

command:SEARCH LINK                                SCREEN 1

general:
author:  AND title:TITANIUM OR (TITANIUM AND ALLOY$) AND subject:  AND descr
iptor:'FRACTURE MECHANICS'
set ID:ALLOYS      query ID:1
DROLS   hc:9       TRANSFERRED:4   w:Y d:N s:Y  fields:  sort:  record:1-4
NTIS    hc:15      TRANSFERRED:15  w:Y d:N s:Y  fields:  sort:  record:ALL
-----

```

Figure 4.

Displaying the List of Queries

A user can display a list of his/her queries with DISPLAY1 QUERY "ALL" command. A specific query may be selected from the list on the workstation screen, and another DISPLAY1 QUERY command will display specific query information. Figure 5 shows a list of all a user's queries used in a DROLS linked-database.

command:DISPLAY1 QUERY			
query ID:ALL	owner:		

query ID:1	public:N	owner:JYOUNG	purge date:9/16/89
query ID:2	public:N	owner:JYOUNG	purge date:NEVER
query ID:BITS	public:N	owner:JYOUNG	purge date:12/31/89
query ID:CARBOX	public:N	owner:JYOUNG	purge date:12/31/89
query ID:RKTFUEL	public:N	owner:JYOUNG	purge date:9/25/89
query ID:TURBOFLUX	public:N	owner:JYOUNG	purge date:12/31/89
query ID:USSR	public:N	owner:JYOUNG	purge date:12/31/89

Figure 5.

Displaying a Single Query

Each query retains information about how it was created and used, including the search strategy of the query, the databases RIM linked to in using the query, the resulting citations and elapsed time taken by the search. In Figure 6, a single query was selected for display.

```
command:DISPLAY1 QUERY

query ID:RKTFUEL      owner:
-----
created:9/1/89      public:N  purge date:9/25/89
text:('JONES JOHN')[AUTH] AND (ROCKET OR FUEL)[TITL]
link ID:DROLS      elapsed time:7      hit count:123
  message:      Result      123 docs
link ID:NTIS      elapsed time:1      hit count:13
  message:      Result      13 docs
```

Figure 6.

Displaying a List of Saved Sets

DISPLAY1 SET "ALL" can display a complete or qualified list of a user's sets. A specific set may be selected from the list on the workstation screen, and another DISPLAY1 SET command will display a list of records in that set or a single record. Figure 7 shows the display of list of sets saved by this user.

```
command:DISPLAY1 SET

set ID:ALL          owner:
record #:           display fields:
qualify fields by link ID:   link ID:
quality fields by query ID:  query ID:
-----
set ID:ALLOYS
  desc:
  created:9/16/89   public:N   owner:JYOUNG       purge date:12/31/89
  records:19
  status:
set ID:CARBOXY
  desc:CARBOXYHEMOGLOBIN
  created:8/18/89   public:N   owner:JYOUNG       purge date:NEVER
  records:2
  status:TRANSFER 2 RECORD(S) TO AP22@STILAS, 8/25/89, 16:39
set ID:USSRPLAST
  desc:SOVIET PLASTICS
  created:6/4/89    public:N   owner:JYOUNG       purge date:12/31/89
  records:2
  status:
```

Figure 7.

Displaying a List of Records in a Set

Once you have found the id of a set you are interested in, you can display the list of records in the set or information about one record. To display a list of the records in the set, set RECORD # to "ALL" indicating that you want STILAS to display all of the set's records. In Figure 8 the user has displayed a list of ALL records in the set "ALLOYS" by title (TITL) and report date (RPDT).

command:DISPLAY1 SET	SCREEN 1 (MORE)
set ID:ALLOYS owner: record #:ALL display fields:TITL,RPDT qualify fields by link ID: link ID: quality fields by query ID: query ID:	

1) query ID:1 link ID:DROLS status: Title:Comparison of Processing Properties and Product Properties of Beta III Titanium Alloy Power Metal (PM) and Ingot Metal (IM) Report Date:760600	
2) query ID:1 link ID:DROLS status: Title:Torsion, Pre-Strain and the Fatigue Life of RC-55 Titanium Alloy, Report Date:540700	
3) query ID:1 link ID:NTIS status: Title:Acoustic Emission Detection of Fatigue Crack Initiation and Propagation in Notched and Unnotched Titanium Specimens Report Date:750100	

Figure 8.

Sorting a Set

STILAS can sort the records in a set in ascending order using from one to three fields as keys. The first twenty characters of each field are used for the sort key. After the user presses the SEND key, STILAS will resort the set and respond SORT COMPLETE. In Figure 9, a user has just sorted the records in the set ALLOYS by corporate author and title.

command:SORT SET
SORT COMPLETE
set ID:ALLOYS
sort fields:CORP,TITL

Figure 9.

Translating a Set

Before a set can be uploaded to a database, the records in the set must first be translated to the input format of the intended database. Translating the set performs data validation of every field in each record for minimum and maximum size, required field, data type, etc.

In Figure 10, the user has entered the TRANSLATE SET command, the set to be translated, the format records are to be translated to, and pressed the SEND key. STILAS will read each record in the existing set, modify it as necessary, and replace the translated record in the current set.

```
| command:TRANSLATE SET  
| SET TRANSLATED  
| set ID:ALLOYS      translate to:P-609-A91  
| -----
```

Figure 10.

Transferring the Records in a Set

The TRANSFER SET command sends a translated set of records to one of the user's linked databases. When the user SENDs this information, STILAS verifies that all records in the set have been correctly translated for the intended link, then attempts to transfer each record in the set to the link. When a record is successfully sent to the link, STILAS flags the record so that it will not be sent again on a subsequent transfer of the set.

In Figure 11, the user instructed STILAS to transfer the 19 records in the set ALLOYS to the project database P-609-A91.

```
| command:TRANSFER SET  
| TRANSFER COMPLETE  
| set ID:ALLOYS      link ID:P-609-A91  wait:Y      TRANSFERRED:19  
| -----
```

Figure 11.

WORKSHOPS: TECHNOLOGY INTERFACES

IMPLEMENTING A CD-ROM CATALOG FOR YOUR LIBRARY

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I. Introduction

Every day, I talk to librarians who are excited at the possibilities that CD-ROM is opening up for our profession. Some of those librarians have seen the future already in the form of CD-ROM indexes such as InfoTrac or Silver Platter. Once you get used to having huge databases spinning around in your library, the light comes on and you start thinking, "Maybe we could put our own database on CD-ROM." I am here to tell you, that's happening now! We already have many libraries who have sent us their databases--whether it's from OCLC or MARCIVE or any other MARC source--and put them onto CD-ROM, and their patrons love it.

And once you put your card catalog onto CD-ROM you think, "Maybe we could take this CD-ROM and distribute it to remote sites." That too is happening now. Why is CD-ROM such an ideal way to distribute a catalog throughout the library, all across the base, around the country, overseas? Because it doesn't require telecommunications which makes it ideal for union catalogs as well as individual catalogs. Every station--really just a microcomputer with a CD-ROM on it--can handle your whole catalog, and that of most of the other libraries you work with.

And that's the second thing that excites librarians. The huge capacity of the CD-ROM discs. Without blinking an eye, we can put over 600,000 full MARC records on a single CD-ROM disc. If your database is bigger, we can even accommodate that. We have a union database over in Houston that is two million records. In the past it would have taken an enormous mainframe computer to handle a database of that size; now you can use a little off-the-shelf microcomputer.

There is a third characteristic of CD-ROM-technology that most people think of as a disadvantage of CD-ROM: response time. CD-ROM is inherently slower than the hard disk of a microcomputer, so you may think that a CD-PAC is going to be slow. But I'm going to show you some searches that will zip through hundreds of thousands of titles in nothing flat. Even better than that, the response time is consistent. Consistent response time is easier on the patron than response time that's lightning fast one minute and glacially slow the next. So CD-ROM response time is actually an advantage over online integrated systems.

A fourth characteristic of CD-PACs is that they use new technology and the players are new. The companies that have entered into this market are not the companies that designed Online Public Access Catalogs or OPACs ten years ago.

The CD-PAC vendors can use state-of-the-art programming techniques and benefit from everything we've learned about how people use automated catalogs. So the software is usually nicer than online systems.

And the best part is that the bill for all this high technology is usually nicer, too. When you can run on a microcomputer rather than a mainframe, your hardware costs are less. No need to do backups. No big maintenance bill. No telecommunications. Use off-the-shelf hardware that you may already have.

It's easy to understand why librarians have gotten excited about CD-ROM. But I'm going to let you see for yourselves.

II. Demonstration

We're looking at a database of 230,000 MARC records, and I want you to remember that so you are aware of how fast the system is.

TITLE KEYWORD:

I'm looking for a book that I know has the words "melting pot" in the title.

MELTING POT [ENTER]

{retrieves several titles that have the phrase "melting pot" somewhere in the title}

TITLE BROWSE

Alternatively, I can look through all of the titles in the system, starting with whatever title I know.

FIRST TO FIGHT [F5]

{retrieves the whole title list, positioned at the title "First to fight"}

AUTHOR KEYWORD

You can see from this search that I don't have to know AACRII headings to be able to find my author.

NET ASSESSMENT DIRECTOR [ENTER]

{retrieves "United States. Dept. of Defense. Director of Net Assessment."}

SUBJECT KEYWORD

I know I am looking for "military biography," but it didn't occur to me to look in all these other places.

MILITARY BIOGRAPHY

{retrieves}

- 1 Aeronautics, Military - United States - Biography
- 2 Air pilots, Military - Great Britain - Biography
- 4 Air pilots, Military - United States - Biography

- 1* Military biography
- 1 Military dependents - West (U.S.) - Biography
- 1 Military engineers - Biography

Choose "Air pilots, Military - United States - Biography"
Look at full bib records
Browse from there

MEDICAL SUBJECT BROWSE

This particular library wanted to pull their medical subjects into one place and so we did this special index for them. Let's try a search for subjects beginning "cardio...".

CARDIO

{retrieves all medical subject headings beginning with letters "cardio..."}

CALL NUMBER

If you want to look at your own shelflist or everybody's in a union list, you can. This is a very helpful feature when evaluating collections.

Specific search: UA 646.3 .I73 1985
General search: LB

COMBINED SEARCH

In combined search, we can do all kinds of fancy searches--by a combination of indexes (ANYWORD), by language, location, date, and format.

ANYWORD: TRADE UNIONS
LOC: CLAKE

[Use examples given by audience]

PRINT CAPABILITIES

Show bibliography production, pick lists

NEWS and INFORMATION

Changeable at any time by the library

I hope this presentation has given you an idea of the power of the new CD-ROM systems. But not all CD-ROM systems are created equal.

III. Choosing the right CD-ROM catalog for your staff and patrons

How do you choose the right CD-ROM catalog for your staff and patrons? What do you look for to make the right decision? Look for:

- A. Stability of company and proven commitment to military libraries. Produced in U.S.
- B. Features that are appropriate for your clientele. If powerful searching and printed lists are important, concentrate on systems that offer those features. Give less weight to systems that offer graphics for school kids or maps of your state.
- C. Fair price--leads back into stability of company. (Let's face it--if they don't charge what it costs them, they won't be in business when you need them.)

IV. Purchasing the CD-ROM catalog

Once you have decided which CD-ROM catalog is right for your library, you have to figure out how to pay for it. The easiest way--as long as it is an option--is:

- A. FEDLINK. I don't know how many of you are FEDLINK participants, but you *probably* know that FEDLINK has suffered a fairly major restructuring. This may mean that your favorite system is not available through FEDLINK. At least for now MARCIVE/PAC is available through FEDLINK, but I don't know for how long. If MARCIVE/PAC is not available through FEDLINK you will need to use local purchasing.

- B. Local purchasing.

[For those of you who are CENCARD contract libraries, let me explain that CENCARD is only for catalog cards or MARC records, and cannot be used for CD-ROM catalogs.]

V. Preparing the database

Let's assume that you have made your way through the purchase of a system. What next?

- A. Retrospective conversion

If you do not have any cards in machine-readable form, you need to start with a retrospective conversion.

Retrospective conversion means finding or creating cataloging records in MARC format. MARC is the international standard for the distribution of

cataloging information suitable for loading into a computer. A lot of small or special libraries have resisted using the MARC format because they thought 1) We'll never automate, so what's the use? or 2) If we ever do, our engineers will design something themselves and then we'll just type everything in by hand.

The microcomputer revolution has changed all that. Now even the smallest library is automating. Prices for hardware and software are now within nearly every library's reach. Some of these libraries ARE typing every book in, laboriously, tediously, expensively, slowly, but more and more, these libraries are understanding that MARC is the greatest gift to libraries since Andrew Carnegie. It's fast, it's cheap, and it's a whole lot easier than keying the books in one by one. Even if it were slow, expensive, and difficult, however, it would be worth it. Why? Because MARC is the standard and that means something priceless: it is transportable. If the technology changes in five years, if your patrons want something different in eight years, if you get a bunch of money and expand like crazy and have to upgrade from a Zenith micro to a Tandem mainframe; not to worry: you can take your bibliographic records with you. The theme of this workshop is "Libraries and Technology in Transition"--and nothing could be more true. The only way of "meeting the challenge" is to prepare for transition with a transportable database.

So how do you get MARC records? You may already have MARC records as a result of having purchased catalog cards over the years. This is true for all of the FL libraries that have been using the CENCARD contract. It is also true for those of you who use OCLC. But let's assume that there are still some titles for which you do not have MARC records.

You have many retrospective conversion options:

If funds are tight, you can perform the labor yourselves. If you go with MARCIVE you would purchase our Cataloging Input System and tap into our database.

If funding is no problem, have the vendor do it. MARCIVE, for example, will take your shelflist and key control numbers from it and send you back your database.

MARCIVE is a particularly good source for medical titles (since we have purchased all of the NLM backfiles as well as receiving ongoing cataloging of books, serials and audiovisuals) and government documents (cleaned-up database).

(NOTE for CENCARD libraries: must use local funds)

B. Obtaining your database

Some of you already have a MARC database stored somewhere even if you haven't used it for anything. Finally, you can take advantage of that database.

For example, AF libraries can use CENCARD to obtain their MARC records that have been stored at MARCIVE over the years. You can even use CENCARD to get updates to your database (MARC records for your new acquisitions) through our Ongoing MARC Record Service.

C. Authorities processing

For a lot of people, authority control is a big mystery. They don't know they want it until they see their database without it.

What we mean by authorities processing is looking at each of your Authors, Series, and Subjects to see if the form of heading is obsolete and then consolidating all of the different forms of entry under a single heading.

Think how much easier it is to look under one heading in the catalog rather than two or three or more! Who knows to look under both Underdeveloped areas and Developing countries for the same information? Let the computer pull these together under the modern subject heading Developing countries and then you only have to look in one place.

It's also a matter of image. Here you've gone and justified some sum of money to get this state-of-the-art catalog by telling your superiors that this will bring the library up to date. Then someone comes in to do a search and the catalog is full of old incomprehensible subject headings. Just try explaining why someone interested in Computers has to look under both Electronic Calculating Machines and the new heading Computers. Your up-to-date image just got torpedoed.

Now that you're convinced you need authority control, isn't it going to cost a lot of money? Actually, it would be worth it even if it cost more, but in fact it is a very reasonably priced service.

If you are purchasing a MARCIVE/PAC catalog through FEDLINK, you can even get the authorities processing included without any hassles.

VI. Creating the CD-ROM master and copies

So you've decided you have to have a CD-ROM catalog, you've picked out the best one, you have a database and even figured out how you're going to pay for the whole thing. What is the vendor going to expect of you? Is this step going to be really painful? Especially for those of you who had a tough time with your retrospective conversion, let me assure you--this is going to be easy.

- A. Vendor will ask you to fill out a profile.
- B. Vendor will do the rest. Really reputable vendors (like MARCIVE!) will create a test catalog first to make sure you are pleased with your profile choices.

VII. Maintaining the catalog

- A. Some systems are better than others about this. Look for a system that can be updated on hard disk. MARCIVE introduced this feature first and many other companies scrambled on the bandwagon.
- B. Choose a system that allows the most economical maintenance possible. If the vendor insists on OCLC tapes and you are not an OCLC user already, look at other vendors.

VIII. Enjoying the catalog: The easiest part of all

Comments from catalog users at various MARCIVE/PAC installations:

From a staff member: "It is great--such a timesaver!"

From a student: "Great system! One of the best things the university has done in a long time."

From a researcher "I just completed two days of work in two hours."

From a patron: "The compact disc catalog is a great idea. It's so much easier and quicker than the previous system. Thanks!" (That library had an online PAC before they installed MARCIVE/PAC.)

From a patron: "Thank God, our library has finally come of age!"

Install a CD-ROM catalog at your Library and bask in the rave reviews.

IX. Questions and answers:

- A. How much does it cost?

For an accurate price, please fill out a "Questionnaire to Receive an Estimate on the Cost of MARCIVE/PAC" and return it to

MARCIVE, Inc.
P.O. Box 47508
San Antonio, TX 78265

For those who came after I ran out of questionnaires, please call 1-800-531-7678 and ask for one. From outside the U.S., call 512-646-6161 or write. You can also FAX your request to 512-646-0167.

B. Can we run it on our network? Not the current version; however, we are exploring what it would take to run it on some of the more popular networks.

C. Do we have to buy hardware from MARCIVE? No. All hardware is off-the-shelf.

D. Do you conform to standards?

Yes, MARCIVE uses the full MARC format (both input and output), masters the disc in High Sierra format, and runs under MicroSoft Extensions.

E. What if we have non-MARC records? Write me a letter and send me a test tape with as much documentation as you can get. We can tell if the tape is mappable to MARC format. We have been able to map some non-MARC formats already, but it does entail additional cost.

COGNITION AND ILLUMINANCE

Jon French

**USAF School of Aerospace Medicine
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COGNITION AND ILLUMINANCE

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It's an honor to be invited to your luncheon today. I've been asked to speak to you about some of our research interests in the Crew Performance Lab. I'm not sure why exactly. You are probably suffering from information overload right about now and feel that you need time to digest all these new ideas and technologies before considering any new topics. Well, as mentioned, part of my background is in looking for chemical means and natural means, and I emphasize natural means, to enhance memory. Perhaps I was asked to speak to you today because I might be able to give you some ideas on how you might be able to soak up just a few more kilobytes of information at your convention. On the other hand, it might be because I've been fortunate to be involved in research that is inherently interesting. I know firsthand how easy it is to get into lively discussions about new ways to understand and to improve human cognition, particularly learning and memory. Well, first, I'd like to give you some background about a class of drugs that is teaching us a great deal about memory mechanisms in the brain. Finally, I'd like to describe some of the implications for a research project we just completed involving bright lights, a natural means of improving performance, that may reduce the effects of jet lag.

First, the chemical mechanisms of memory. There is a class of compounds called the benzodiazepines that are good anti-anxiety medications, good antidepressants, good anti-epileptics, and good sedatives. The most familiar benzodiazepine is probably diazepam, or Valium, although that is now a very old compound that hangs around the body much longer than is sometimes useful. However, the benzodiazepines also have the ability to produce a profound amnesia and therein lies their promise for telling us quite a lot about how the brain processes information. Amnesia refers to the loss of the ability to put short-term memory events into long-term storage. Probably the best anecdote regarding this phenomenon is the story of one of the inventors of a very potent short-duration benzodiazepine called midazolam. He had taken the drug to help him sleep during his flight to a meeting in London. When they arrived at Heathrow, he was surprised to find that he was soaking wet. Of course, he asked the stewardess if she knew anything about it. She was amazed that he did not remember that he had fallen asleep with a lit cigarette and caught his clothing on fire. She had doused him with water. He had been profusely apologetic to all around him before he drifted off to sleep. He had no memory of any of it, even when reminded. There are many anecdotes. In one of my research projects with midazolam, I would show subjects 5 or 6 pictures every few hours. We would even joke about whether the picture of an elephant was an African or Indian elephant or the cow Guernsey or Holstein. In each case, they could recite what they had seen immediately after. They had no trouble getting the information into short-term memory. But a few hours later, they were lucky to remember more than 2 pictures. Even if they wrote them down, by a

few hours later, there was no recall. Nor could they remember how many injections they had been given. There were three injections separated by 15 minutes and usually given into the back of the hand by a rather large intern. This is a stinging route of administration, yet most underguessed, saying two injections had been given. Even in our own local paper there was the story last year of a team of female bandits with apparently some knowledge of pharmacology. They were called the Rolex bandits because they would approach out-of-town businessmen who were wearing Rolex watches, and the bandits thought the businessmen would have fatter wallets. They dropped triazolam into their victim's drink and then, once the medication had taken effect, invited him back to their room. Of course, the poor fellow would be found the next day in another county wandering about not knowing how he got there and unable to identify his assailants. Profound amnesia. Which means these drugs must be interfering with the very heart of the memory process.

Now this amnesia is not a problem if you are having difficulty getting to sleep and the faucet starts to drip. You quickly forget about the faucet. Or if you're in a holding room prior to surgery and are given a benzodiazepine as a pre-anesthetic. This is a typical use for them. You quickly forget that you're about to go into an operation or that the patient next to you is moaning in pain. It becomes a problem if the medication hangs around too long in aircrew, for example. You don't want them forgetting where the target is or how to get there. Accordingly, there is a very safe 12-hour down time required before flying after taking one. And fortunately, the compound suggested for limited use by aircrew, temazepam, is very short acting and has the fewest amnestic properties of the sedating benzodiazepines.

The military interest in the benzodiazepines results from their use as a sleep inducer. In some cases, it is difficult to fall asleep and get your rest when an important mission is at stake. Consider, for example, how difficult it would be to get adequate rest knowing that the next morning you were flying a complicated low-level strike into, let's say Libya. The benzodiazepines are a much safer and more effective treatment for insomnia than the 40-year-old barbiturates like Seconal that they replace. The British made extensive use of the benzodiazepine, temazepam, during the Falklands Island campaign. Their aircraft would fly from England to the Azores, the South Atlantic, and back exchanging fresh crews along the way, sort of like the Pony Express except that the crews would change rather than the transportation. The British use of temazepam was to alter the normal sleep-wake cycle so that crews could be ready round the clock for air support.

The insight that a compound which produces true amnesia could provide to learning and memory research is profound. It is only recently that benzodiazepine receptors have been found in the brain. This discovery is quite remarkable. Why would we have a Valium receptor in the brain unless there was a natural substance, a natural benzodiazepine, for it to use. A few decades ago, naturally occurring opiate receptors were found in the brain that led to the identification of the enkephalins and endorphins, the natural pain killers. One day someone will find naturally occurring benzodiazepine, and it's probably not a coincidence that most of these receptors are in the hippocampus, an area long recognized as a memory terminal or gate. The

natural benzodiazepine will tell us volumes about how the brain stores information, or in the case of amnesia, how it is shut out. We may be able to open those gates farther and let more information in. A large number of drug companies are betting that future research may lead to the development of a memory enhancer, particularly to help people with memory impairment.

One of the areas for designer drugs in which we were interested was the area of benzodiazepine antagonism. Many of you may know that there are agonists that act like a parent compound and antagonists that reverse those effects. Valium is a benzodiazepine agonist, for example. Recently a benzodiazepine antagonist called flumazenil was discovered. Many people in the world are very interested in this compound, not only because it can reverse benzodiazepine-induced sedation, but also because it may have anti-amnestic effects. Suppose aircrew were required to take a sedative, but conditions changed and they were required to return to duty after only 4 hours of sleep. We don't want them flying under the influence, and flumazenil gives us that option. As far as we know, it is a benzodiazepine antidote. In this mix of agonists and antagonists is a third category, a class of compounds called inverse agonists. These are drugs that occupy the receptor like an agonist, but have the exact opposite effect, the inverse effect. What would the opposite of an amnesia-producing drug be? Would it be a drug that promoted memory? Many people think so. The problem is the few that have been developed have reversed another effect of the benzodiazepines, their anti-anxiety effect. The drugs improved memory slightly, but they produced sheer terror in the subjects. In Sweden, where most of the work has been done, professional drug takers volunteered to be studied.

I heard a lecture by one of the discoverers of an inverse agonist, and he described how the professional drug taker was begging to be brought off the medication. But they may be on the right track. Consider when it's easiest for you to absorb information. When you have to learn because the test is tomorrow and your anxiety level is quite high. You can easily absorb more information in this heightened state of alertness. Maybe we need some modicum of anxiety to open the information gate into memory.

During my years in the pharmaceutical industry, I worked in the areas of anti-Alzheimers. However, everyone knew that the discovery of a cognition enhancer for these patients would have far-reaching implications. Who would have them? Would they be considered an unfair advantage on college boards? Would you have to pass a urine test before taking the SATs or the MCATs? We often thought that there would be a military application for such a compound. The MI tank manual is several thousand pages long. High performance aircraft manuals occupy volumes of technical data. A memory drug might improve the odds for our soldiers faced with information overload in a highly technological arena.

I don't think we will have to resolve the weighty issues of who gets cognition enhancers for several years yet, but the issue is coming. It may be interesting to you that the strongest area of anti-Alzheimers research right now is in the area of cholinesterase inhibitors. These are drugs that inhibit the enzyme that breaks down acetylcho-

line. They have the same action as nerve agents, the so-called nerve gas. It seems ironic to me that the compounds that can be used to kill so effectively may give new mental life to an Alzheimers patient. The principle is that Alzheimers patients lose many of their acetylcholine cells. Since the drug prevents the synapse from being cleared of acetylcholine, it allows what little is left to hang around and be used more efficiently.

I mentioned that benzodiazepines were often used to overcome the demands of our biological clocks. The British used temazepam during the Falklands War to promote sleep in aircrew needed around the clock. This leads me into another area we're investigating, that of resetting the biological clock using bright lights. I like it because it's a non-drug way of improving performance. Some of our research and that of others suggests that the use of standard overhead lighting, perhaps a little brighter than what we have now, can help people to stay active on a task and make fewer errors than people in dim lights.

It's probably no accident that the Chernobyl disaster occurred at 3 a.m. or that our own Three Mile Island and many train wrecks occur early in the morning when the operators, usually at dimly lit consoles, are most fatigued. We have within us a biological clock that requires a set period of time for rest and for activity. As a consequence of having evolved on a planet with a 24-hr solar cycle, this clock can be set by the presence or absence of light. Melatonin is a hormone produced by the pineal gland that most likely provides the means for altering the clock. Melatonin levels are greatest in the evening, beginning right at sunset, and reaching a peak about 10-12 p.m. when we are most tired. If you ingest physiologically active amounts of melatonin, even if you are rested, you get tired. Melatonin then seems to be the natural fatiguing agent that responds to the absence of light which adjusts our clocks. As an example of how sensitive we are to biological rhythms, consider the Monday morning blues. First, we work hard all week establishing a rhythm, getting up at the same time everyday to get to work and to bed at the same time each night. On Saturday and Sunday we allow ourselves the luxury of sleeping in, and in so doing, alter our sleep-wake cycle. The sleep-wake cycle isn't resynchronized until about Wednesday. There is the recent story of the Italian lady caver in New Mexico kept underground in constant dim illumination for 4 months. She lost all track of time and of all zeitgebers or time setters which are important cues like sunrise or sunset or breakfast or dinner that help us establish our sense of time. She emerged thinking that only 2 months had passed. Her menstrual cycle stopped. She would be active for 25 hours and then sleep for 10. This finding is very consistent with other such experiments.

Recently it has been found that bright lights suppress melatonin. If melatonin is the natural fatiguing agent and if it is suppressed by light, then can exposure to bright lights suppress fatigue? We recently completed a study that suggested this may be the case throughout much of the night. We kept our subjects up for 30 hours. They couldn't leave their desks and had to do the same series of computer tasks over and over every 2 hours throughout the night and into the next day. Subjects in the bright light group had improved scores on many of the measures over those in the dim light

group. It may be that those lonely late night vigils at a radar scope in an AWACS plane or in a silo or ship might best be manned with the lights on, not dimmed as they are now. The lights could be adjusted as in our study to prevent a glare on the screen.

There have been some striking findings in the field of photobiology. A condition known as seasonal affective disorder, or SAD, does not respond to normal anti-depressant medication. It seems to be most prominent in the northern latitudes when the sun appears in the winter sky for only a few hours. In many cases this depression has been successfully treated with light therapy. Light seems to help us overcome early morning fatigue and seasonal depression. Perhaps the most meaningful use of light may involve phase shifting. A study in Science magazine recently detailed how, with just a few hours of light treatment over 3 days, an individual's biological rhythms were shifted by 12 hours. This effect is similar to preparing a New York business executive for a trip to the Orient with a series of bright light exposures; arrival in Thailand, for example, would occur with biological rhythms in sync to the destination's time zone, thus avoiding jet lag.

We all know what jet lag is. Many of you may still be suffering from its effects or will experience them on your return flights home. The term "jet lag" came about because of a trip to Egypt made by John Foster Dulles in 1953 over the Polar route. He crossed several time zones in this route alternately shortening and lengthening his exposure to daylight along the journey. He landed in Egypt and had to immediately go into negotiations with the Russians for the Aswan Dame project. Needless to say, he was quite fatigued by the journey and did not do well in the negotiations. Egypt fell under a Russian influence for many years due to this failure. He blamed the route, which is no longer used, by the way, and the papers called the effect "jet lag."

Recently we were asked what sort of preparations could be used to ready troops landing in another distant part of the world. There isn't any set policy. Never before have we been able to whisk troops to an active site in hours not weeks. During WWII troop ships would take weeks to make the crossing and people had time to adjust. As we shorten the time required of distance and we make longer foreign policy commitments, this consideration will become even more important. Perhaps with enough research into the best ways to phase-shift personnel, like the New York businessman exposed to lights, we could better prepare them for new time zones. There may come a time when air travelers who want to prevent or reduce jet lag may find it useful to look up an equation based on the distance and time zones of travel to calculate bright-light exposures for their particular trip. We may want to prepare the biological clocks of a rapid deployment force before it lands on a new distant time zone. You, as military librarians, want to make sure that the lights in your home institutions are kept bright.

I hope I've given you some idea of the research questions we ponder here. I told you at the beginning that my little discussion today might give you some ideas to help you soak up more information, how you could be cognitively enhanced. Well, I hope you have heard the message to stay away from drugs, especially those touted to be cognition activators, since they may induce anxiety. Also stay away from dark

rooms in big lecture halls in the late afternoon. If you have to attend those slide sessions today, make sure you get under some bright enough light in between sessions to keep your melatonin levels low.

NEW OPTIONS FOR COLLECTION ANALYSIS

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Library administrators are increasingly held accountable by their governing authority for the effective management of their library's collection and the materials budget which supports it. Funding constraints, coupled with rising prices, the ever-increasing number of journals, and the need for access to information available in machine-readable databases, call for careful planning as never before. As collection managers, you must ensure the full utilization of available resources, and you must be prepared to justify funding requests and expenditures. Objective data describing your library's collection can be a valuable tool for this process.

The OCLC/AMIGOS Collection Analysis System was established in 1989 by the Online Computer Library Center (OCLC) and the AMIGOS Bibliographic Council to provide quantitative and comparative data that can assist collection managers to document their collection's strengths and weaknesses without labor-intensive manual effort. The analysis is based upon information derived from MARC bibliographic records; call numbers in these records are matched against a predefined classification table to yield statistical data, and other record elements are utilized to obtain bibliographic data reflecting the library's holdings. The machine-readable holdings of a single library can be studied, and multiple institutions can be compared. This capability is a byproduct of the investment libraries have made in performing cataloging operations using the OCLC system or other databases.

OCLC/AMIGOS Collection Analysis Systems offer two options for quantitative collection analysis: Collection Analysis CD and Tape Analysis. Collection Analysis CD draws on the extensive holdings of the OCLC Online Union Catalog to support a series of structured comparative reports, accessible on a local microcomputer with compact disc. Tape Analysis utilizes library MARC tapes to produce a custom designed computer analysis of specific files, for a single library or a resource-sharing group. All services are offered solely through AMIGOS Bibliographic Council on behalf of OCLC and AMIGOS.

TAPE ANALYSIS

Let me describe briefly how Tape Analysis works. Libraries submit tapes of their bibliographic records in MARC format, which are analyzed to reveal holdings data in their desired subject categories. The analysis process matches call number fields in the library's records against a classification table which the library has defined. The records are counted, and reports are produced. From this process, the library can obtain statistics in predefined subject groupings and bibliographic listings. We can

work with MARC records from many sources, including tapes output from local automated systems.

COLLECTION ANALYSIS CD

Collection Analysis CD offers a structured process that yields information about the extent of overlap, uniqueness, and gaps that characterize the user's holdings compared against those of other libraries represented in the CD database. The system uses a subset of approximately 1.6 million abbreviated bibliographic records derived from the OCLC Online Union Catalog (along with the associated holdings information) and mastered onto a compact disc. To benefit from the system, your holdings should be part of the OCLC Online Union Catalog for the greater part of the decade covered by the CD database. Subscribers do not have to submit MARC bibliographic tapes to utilize Collection Analysis CD; their holdings that conform to the CD database's selection criteria have been previously extracted from the OCLC online system prior to mastering the CD. Collection Analysis CD is installed on a microcomputer with compact disc drive, and operates independently of the OCLC online system. Both statistical and bibliographic reports are produced. The system is updated annually.

Titles selected for inclusion in the database for the initial version were published between 1977 and 1987. Each record contains a Library of Congress classification number and is held by at least one academic or research library. Serials and government publications have been excluded, leaving a monographic database which forms the context for comparisons among libraries with holdings represented in the OCLC database.

The system's applications software allows users to compare their library's collecting activity against that of 14 predetermined peer groups comprised of almost 1,000 academic and research libraries that were active catalogers on OCLC during the decade covered by the database (1977 to 1987 in the first version of the system). The comparison peer groups are determined by collection size; libraries with collections of less than 700,000 volumes are further structured into additional groups based upon the highest degree granted by that institution (doctoral, masters, or undergraduate degree only).

For a library desiring comparisons against a group of institutions not specifically represented among the 14 standard peer groupings, there is an option of designating an additional peer group at the time of ordering Collection Analysis CD. This user-defined peer group can be chosen from among any OCLC system users--it is not limited to academic libraries. It supports a comparative study which can be focused toward the user's specific objectives.

Reports derived from the system give statistical or bibliographic data which can be displayed on your microcomputer screen or printed locally on your printer. The statistical reports are organized into subject categories based upon Library of

Congress classification ranges. Two levels of statistical detail are provided. The "collection" level is based upon 32 broad LC classification categories; the "sub-collection" level gives a more detailed breakdown based upon National Shelflist count categories.

The bibliographic reports are also organized into subject sequence, based upon the LC call number contained in the master record in the OCLC Online Union Catalog. Bibliographic citations can be exported to an ASCII file, for transfer to another system or for editing with your word processing software.

To better understand the types of information Collection Analysis CD can provide, it is useful to examine some typical screen displays from the system. The system is menu-driven and is supported by help screens throughout. First is the main menu (Figure 1). From this display, you can choose the major report categories: statistics (metrics) at the collection or subcollection level, and bibliographic lists. An additional selection takes you into a display where you can establish default parameters for each session. Default values allow you the convenience of establishing a single peer group and subject categories for use throughout a work session, to avoid rekeying of these parameters. The default values may be temporarily replaced for viewing a specific display, or can be reset at any time during the session by returning to the default parameters screen.

METRICS REPORTS

After the report category "Collection Metrics" is chosen from the main menu, a second menu (Figure 2) allows you to select the type of report desired: counts, proportions, overlap, holdings distribution, gap, or uniqueness. Note that there are prompts at the bottom of the screen to guide the user in moving through the system or in summoning a help screen.

A look at the Collection Proportions report (Figure 3) illustrates the type of information provided by the system. The display is structured into 32 broad groupings (A to AZ, B to BJ, etc.) of LC classification numbers under the heading "Division." In each division--and throughout the system--you can identify your title count under the heading "Evaluator." Comparisons can be made against the holdings of an average member of the peer group designated for that specific display. You can also determine the percentage of your titles and of the peer group's titles that fall into each subject division. Note that the comparison peer group's holdings are compiled; you view total or average record counts, but not the holdings of each individual member of the peer group.

The Subcollection Metrics reports offer the same type of reports as the Collection Metrics, only at greater detail afforded by approximately 500 subject categories based upon the National Shelflist Count (NSL).

The Subcollection Counts report (Figure 4) is useful for providing a baseline measure of comparative holdings. One can pinpoint the evaluator's title count in each NSL division, and see the extent to which the evaluator's holdings overlap with those of the designated peer group. The peer group's total title counts are also given, as are the number of titles held by only one member of the peer group. The "holdings" columns refer to the number of peer group libraries' 3-character OCLC institutional symbols which are linked with the title counts.

The Subcollection Overlap report (Figure 5) examines in greater detail the overlap condition revealed in the Counts report. It shows the number and percentage of the evaluator's titles that fall into subsets of the LC "R" classification and which overlap with the peer group's titles. It also reveals how widely these titles are held, by highlighting the holdings (OCLC symbols of peer group libraries) associated with the title for which an overlap condition has been identified.

The Subcollection Holdings Distribution report (Figure 6) exemplifies the relationship between the evaluator's holdings and the peer group. The evaluator's titles within the selected subject are compared for the intensity of overlap against the peer group, using an overlap distribution scale that ranges from unique (not overlapping) to 100%. You can determine from data in this sample report that 7 titles in your collection are also held by 19 libraries, or between 10% and 19% of the peer group.

The Subcollection Gap report (Figure 7) shows the size of your library's holdings compared with the selected peer group. You can identify the intensity of the peer group's holdings of titles which your library lacks, using a distribution scale that ranges from unique to 100%. You can determine from this sample report that your library is not lacking titles which are widely held by the peer group; there are 36 titles held by between 1% and 19% of the peer group, but not by your library.

The Subcollection Uniqueness report (Figure 8) identifies the number of uniquely held titles in the NSL divisions (using the "R" classification in this example) for the evaluator and the peer group. It also shows the number of unique titles held by the average member of the designated peer group.

BIBLIOGRAPHIC REPORTS

Bibliographic reports support a better understanding of the Metrics reports by revealing the actual titles which constitute the statistical data. They also can be used for a variety of other purposes, such as to create a bibliography or a desiderata list. The Bibliographic Lists Menu (Figure 9) provides access to the bibliographic reports, which lists those titles which are identified by the conditions of: overlap, gap, or uniqueness, plus listings of all those titles represented in the CD database as belonging to the evaluator or one of the system's peer groups.

A look at the Evaluator Gap Titles report (Figure 10) reveals a one-line display which consists of a brief citation: LC classification number (taken from the OCLC system's master bibliographic record), author and title, year of publication, and the number of institutions within the comparison peer group that own the title. A windowing capability activated by a function key displays more detailed bibliographic information, including publisher, OCLC control number, and ISBN (if present in the OCLC master record). The Gap report is typical of the type of bibliographic information contained in all the bibliographic lists. It highlights those titles belonging to the comparison peer group, but not to the evaluating library.

These lists can also be focused by adjusting the report parameters to display a narrower range of holdings institutions in the comparison peer group (e.g., titles held by 75% of the group), a narrower range of publication years (or a single year) or a particular language such as English, French, German, etc. This selectivity allows you to focus the lists on those titles most compatible with your own collecting policies or plans.

You may use the bibliographic citation to perform a more extensive search, or as the basis for a desiderata list. Remember, you can print these lists using a printer attached to your terminal, or you can save the records to an ASCII file for later editing.

What do you get with a subscription to Collection Analysis CD? The complete package includes one compact disc with the 1.6 million record database, the applications software which enables you to produce the comparative reports, and your own institution's data on floppy diskettes. The Standard Version of the system automatically supports comparisons with 14 standard peer groups. With the Standard Plus version you also have the option of defining an additional peer group of your choice, taken from any OCLC participants for a maximum of 99 OCLC symbols.

The equipment required to operate Collection Analysis CD includes an OCLC M310 Workstation or an IBM AT microcomputer with at least 640 KB RAM, a 20-MB hard-disk drive, a 1.2-MB high-density 5-1/4-inch (or a 3.5-in. 1.44-MB) floppy disk drive, and IBM DOS 3.1 or greater. You also need a Hitachi CD drive and MS-DOS CD-ROM Extensions, version 2.0 or greater. A printer is highly recommended. Alternative configurations may be possible, but should be evaluated prior to purchase of Collection Analysis CD, to ensure compatibility.

CONCLUSION

How will your library or resource-sharing group make use of the information you can obtain from either Tape Analysis or Collection Analysis CD? In your own library, you can use collection analysis data to:

- * Evaluate collection development policies
- * Set priorities for new purchases

- * Justify budget requests and allocations
- * Evaluate collection growth patterns
- * Respond to changes in your library's mission, user needs, and funding levels
- * Prepare statistical reports for a variety of purposes

Resource-sharing groups can:

- * Evaluate group holdings, so as to identify strengths, weaknesses, and uniqueness and to maintain a core collection if desired
- * Justify plans and funding requests
- * Coordinate materials purchases
- * Set priorities for joint projects

With concrete data describing your library's collections, you can make informed and confident choices on matters affecting these resources and the patrons who will use them. Thank you for your interest in OCLC/AMIGOS Collection Analysis Systems.

Collection Proportions
Peer Group: Select Academics - High Admission Stds (27)

Division	----- Titles ----- Evaluator	Avg Mbr	Comparative Size	--- Pct of Collection --- Peer Group	Evaluator
A-AZ	1,059	275	3.85	0.3	0.7
B-BJ	4,259	3,697	1.15	4.1	2.9
BL-BX	2,843	4,222	0.67	4.7	2.0
C-CZ	683	436	1.57	0.5	0.5
D-DZ	5,805	5,154	1.13	5.7	4.0
E-FZ	5,303	3,386	1.57	3.8	3.6
G-GZ	4,968	2,012	2.47	2.2	3.4
H-HZ	25,692	16,277	1.58	18.1	17.7
J-JZ	3,290	2,638	1.25	2.9	2.3
K-KC	391	403	0.97	0.5	0.3
KD-KDK	107	89	1.20	0.1	0.1
KE-KEZ	30	23	1.30	0.0	0.0
KF-KFS	2,606	1,483	1.76	1.7	1.8
L-LZ	6,131	3,043	2.01	3.4	4.2
M-MZ	2,828	1,449	1.95	1.6	1.9

F1: Help F4: Back Up Esc: Main Menu PgUp PgDn

Figure 3. Collection Proportions Report.

Subcollection Counts R-RZ Medicine
Peer Group: Select Academics - High Admission Stds (27)

NSL 500	----- Peer Group ----- Titles Holdings Unique	Evaluator Titles	----- Overlap ----- Titles Holdings
R1-R0130	222 779 84	56	49 323
R0131-R068	290 1,399 117	67	62 676
R0690-R899	1,493 7,254 386	479	449 3,575
RA0003-RA0	979 5,078 264	349	336 2,787
RA0421-RA0	1,752 7,450 539	746	629 4,253
RA0791-RA0	31 119 11	11	10 62
RA0960-RA0	806 2,996 262	257	239 1,446
RA1001-RA1	85 297 32	26	23 142
RA1190-RA1	451 1,810 109	185	177 1,033
RB1-RB9999	695 2,100 207	269	241 1,046
RC1-RC0106	743 1,847 351	189	158 655
RC0110-RC0	336 1,113 101	120	103 540
RC0254-RC0	1,141 3,392 408	331	285 1,293
RC0306-RC0	9 31 0	4	3 18
RC0321-RC0	1,187 5,103 291	534	490 3,078

F1: Help F4: Back Up Esc: Main Menu PgUp PgDn

Figure 4. Subcollection Counts Report.

Subcollection Overlap
Peer Group: Select Academics - High Admission Stds (27)

NSL 500	----- Titles -----			----- Holdings -----		
	Evaluator	Peer Group	Pct	Evaluator	Peer Group	Pct
R1-R0130	49	222	0.22	323	779	0.41
R0131-R0687	62	290	0.21	676	1,399	0.48
R0690-R8999	449	1,493	0.30	3,575	7,254	0.49
RA0003-RA0420	336	979	0.34	2,787	5,078	0.55
RA0421-RA0790	629	1,752	0.36	4,253	7,450	0.57
RA0791-RA0955	10	31	0.32	62	119	0.52
RA0960-RA0998	239	806	0.30	1,446	2,996	0.48
RA1001-RA1171	23	85	0.27	142	297	0.48
RA1190-RA1270	177	451	0.39	1,033	1,810	0.57
RB1-RB9999	241	695	0.35	1,046	2,100	0.50
RC1-RC0106	158	743	0.21	655	1,847	0.35
RC0110-RC0253	103	336	0.31	540	1,113	0.49
RC0254-RC0298	285	1,141	0.25	1,293	3,392	0.38
RC0306-RC0320	3	9	0.33	18	31	0.58
RC0321-RC0431	490	1,187	0.41	3,078	5,103	0.60

F1: Help F4: Back Up Esc: Main Menu PgUp PgDn

Figure 5. Subcollection Overlap Report.

Subcollection Holdings Distribution
Peer Group: Select Academics - High Admission Stds (27)

Division	Holdings Range	----- Titles -----			--- Pct of ---	
		Eval- uator	Peer Group	Average Member	Evaluator Peer	Avg Mbr
RL1-RL9999	90-100%	0	0	0	0.00	0.00
Dermatolgy	80-89%	0	0	0	0.00	0.00
	70-79%	0	0	0	0.00	0.00
Current:	60-69%	0	0	0	0.00	0.00
Peer Holdings	199 50-59%	0	0	0	0.00	0.00
Overlap Holdings	48 40-49%	0	0	0	0.00	0.00
Evaluator Titles	44 30-39%	0	0	0	0.00	0.00
Comparative Size	597% 20-29%	0	0	0	0.00	0.00
	10-19%	7	19	3	0.37	2.78
	1-09%	18	42	3	0.43	6.94
	Unique	19	61	2	0.31	8.41
TOTAL	0-100%	44	122	7	0.20	3.39

F1: Help F4: Back Up Esc: Main Menu

Figure 6. Subcollection Holdings Distribution Report.

Subcollection Gap
Peer Group: Select Academics - High Admission Stds (27)

Division		Holdings Range	---- Gap Titles ---- In Range Cumulative	Comparative Size
RL1-RL9999		90-100Z	0	0
Dermatolgy		80-89Z	0	0
		70-79Z	0	0
Current:		60-69Z	0	0
Evaluator Titles	44	50-59Z	0	0
Comparative Size	597Z	40-49Z	0	0
		30-39Z	0	0
		20-29Z	0	0
		10-19Z	12	12
		1-09Z	24	36
		Unique	61	97
TOTAL		0-100Z	97	97

F1: Help F4: Back Up Esc: Main Menu

Figure 7. Subcollection Gap Report.

Subcollection Uniqueness
Peer Group: Select Academics - High Admission Stds (27)

Division		--- Number of Unique Titles --- Peer Evaluator Avg Mbr	
RL-R0130	Medicine: General Topics	84	7
R0131-R0687	Medicine: History	117	5
R0690-R8999	Medicine: Special Subjects	386	30
RA0003-RA0420	Medicine & the State	264	13
RA0421-RA0790	Public Health	539	117
RA0791-RA0955	Medical Geography	11	1
RA0960-RA0998	Medical Centers, Hospitals,	262	18
RA1001-RA1171	Forensic Medicine, Medical J	32	3
RA1190-RA1270	Toxicology	109	8
RB1-RB9999	Pathology	207	28
RC1-RC0106	Internal Medicine, Medical P	351	31
RC0110-RC0253	Infectious & Parasitic Disea	101	17
RC0254-RC0298	Neoplasma, Neoplastic Disea	408	46
RC0306-RC0320	Tuberculosis	0	1
RC0321-RC0431	Neurology	291	44

F1: Help F4: Back Up Esc: Main Menu PgUp PgDn

Figure 8. Subcollection Uniqueness Report.

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===== COLLECTION ANALYSIS CD =====
      Bibliographic Lists Menu

      O) Overlap

      G) Gap

      U) Unique Evaluator

      N) Unique Peer Group

      E) Evaluator List

      P) Peer Group List

      Select an item from above

===== F1: Help   F4: Back Up   Esc: Main Menu =====

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Figure 9. Bibliographics Lists Menu.

Evaluator Gap Titles
XYZ to Select Academics - High Admission Stds (27)
Holdings Range: 0-100% (1-27 libraries) Pub Year: 1977-87 Lang: ALL

Holdings Range: 0-100% (1-27 libraries) Pub Year: 1977-87 Lang: ALL

Holdings Range: 0-100% (1-27 libraries) Pub Year: 1977-87 Lang: ALL

LC Class	Author / Title	Pub Yr	Peer Holds
1 RL1	Washington, D.C. Der / The Washington, D.C. D	1981	1
2 RL1	Washington, D.C. Der / The Washington, D.C. D	1982	1
3 RL31	Dermatology proceedings of the XV internat	1979	1
4 RL39	Alexander, Suzanne. / International coding in	1978	2
5 RL61	Dobson, Richard L. / The practice of dermatol	1985	2

F1: Help F4: Back Up F5: View F6: Save Esc: Main Menu PgUp PgDn

Figure 10. Evaluator Gap Titles Report.

TOTAL QUALITY MANAGEMENT

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IMPLEMENTING TQM WITH MGEEM

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There is widespread interest throughout the Department of Defense (DOD) in implementing Total Quality Management (TQM). There are a number of different definitions of TQM, but it is almost universally agreed that its essence is embodied in the philosophy and teachings of W. Edwards Deming. Dr. Deming's wisdom is available in his 4-day seminar, his books (e.g., Deming, 1986), and video tapes. Other books on Dr. Deming and his wisdom are by Gitlow and Gitlow (1987), Killian (1988), Mann (1985), Sherkenback (1988), and Walton (1986). Commanders and managers tasked to implement TQM in their organizations often report, however, that implementing TQM is far more difficult than understanding it. In our experience, implementing TQM is almost always characterized by uncertainty, confusion, false starts, management's delegation of its TQM responsibilities, a burst of activity to "fill a square" and then back to business as usual, and money virtually wasted on contractors and consultants.

To our knowledge, efforts to implement TQM follow two basic approaches. The first is the use of a high-level steering committee which originates and directs problem-solving teams, commonly called process action teams (PATs). The second involves (a) Management in authority teaching TQM philosophy so that a critical mass of employees becomes involved in the necessary cultural transformation and (b) hiring a master statistician who provides statistical assistance throughout the organization. Under ideal conditions these approaches produce favorable results, but experience shows that conditions are usually far from ideal. For instance, a common result of the steering committee/PAT approach is that it is an easy way for commanders and managers to avoid their TQM responsibilities. They merely set up a few PATs and return to work as usual. They "fill squares" by pointing to the number of PATs in place, the number of people who get PAT training, the number of PAT reports provided, and the resources spent on their TQM effort. It is true that when the steering committee/PAT approach is used, processes are improved, but the real problem is that no attempt is usually made to bring about the transformation called for by Dr. Deming.

There are other improper uses of the steering committee/PAT approach. Steering committees almost always set up PATs based solely on judgment, usually in areas where they hear the most complaints. This approach will often be successful in improving processes until the obvious problem areas are improved. But after the obvious problem areas are improved, what next? Where are new PATs established? Beyond the very serious few, steering committees seldom know which other areas have problems that are serious enough to deserve the attention and resources of a PAT. Steering committees seldom have a systematic approach to the establishment of PATs. Ideally, the most serious problem areas should be addressed first. Often

steering committees will establish PATs everywhere (even where they are not needed) or delegate the decisions about where to establish them to the judgment of lower-level personnel. In such cases a memorandum goes out, "Who wants to be on a PAT in such-and-such division? Volunteer, please contact the division chief by such-and-such date." Volunteers are then given training in the Deming cycle and the 7 tools and turned loose to work any problems they wish. No guidance is provided concerning the importance of alternative problem areas. PATs developed in this way often operate for a few months, analyze one process, file a mandatory report, and disband. A PAT is especially likely to decay if management untrained in Deming philosophy fails to act upon the team's recommendations. Dr. Deming says that management's unwillingness to respond to suggestions to improve the system is the main reason for the failure of quality circles in this country.

Another common misuse of the steering committee/PAT approach is that PATs usually work problem areas on a short-term basis. After a PAT achieves some initial results, such as submitting frequency data on "loops" in the flow chart of an important process, a report is written and the PAT disbands. Then a different PAT is established for another problem area. The misuse is that the problem area worked by the disbanded PAT ceases being systematically improved. This methodology violates a central tenet of Dr. Deming's philosophy: continuous and never ending improvement. Another problem in the usual approach to PATs is that recommended changes may help a process or department where a PAT is assigned, but may have harmful effects elsewhere in the organization. (In his 4-day seminar, Dr. Deming discusses this general problem with a handout; entitled "On Cooperation: An Exercise for the Working Groups." The example in the handout stresses that "management allots to [organizational components] individually the responsibility for certain goals of improvement. Each [component] is then driven to actions that will maximize its own individual benefit, without concern for the other areas." Another problem with the steering committee/PATs approach is that workers who are not on a PAT can be virtually uninvolved in TQM which violates Dr. Deming's point 14, "Put everyone to work to accomplish the transformation."

Implementing TQM by the second approach, "management teaching Dr. Deming's philosophy and employing a master statistician," can also have limitations. Perhaps the most serious limitation is that this approach does not provide sufficient structure and guidance on exactly how to implement TQM. Commanders and managers who are highly motivated to implement TQM confide that they are uncertain and confused about exactly what to do with this approach. They report feeling the need to seek the services of one of the very costly TQM consultants that have recently sprung up around Dr. Deming and the beltway. Even when such consulting services are secured, the assistance turns out to be workshops on the consultant's version of Dr. Deming's 14 points, deadly diseases, and obstacles or Statistics 101. Usually no substantive guidance is provided in implementation beyond perhaps the use of the Steering Committee/PAT approach. Another problem with the teach philosophy/hire a statistician approach is the requirement to hire a master statistician. Many DOD organizations, especially in the test and evaluation (T&E) and research and development (R&D) areas, have on their staffs some of the best trained and most

experienced statisticians in the country. It is claimed, however, that these statisticians can't do the TQM job because they were taught statistics incorrectly, namely they were incorrectly taught that enumerative statistics can be applied to analytical problems. Furthermore, it is claimed that they fail to fully appreciate that variations in any process can be partitioned, usually with control charts, into special (or assignable) and common causes as a basis for management action to make processes predictable. There is no disputing the great value of control charts, especially in assembly line operations, or of Dr. Deming's teaching on special and common causes. However, a past president of the prestigious Japanese Union of Scientists and Engineers (JUSE) made an observation worth considering. He said that Japanese experience shows that the first 90% of quality and performance problems can be identified for solution with 6 of the so called "7 tools," another 5% can be identified for solution with the other one of the 7 tools, the control chart, and the last 5% can be identified for solution with the so-called "7 new tools," also known as the Taguchi methods. (The list of 7 tools varies but includes Ishikawa diagrams (also known as cause-and-effect and fishbone diagrams), Pareto charts, checksheets, histograms, scatter diagrams, control charts, stratification, flow charts, run charts, and various graphs (see Ishikawa (1982) and Bossard (1988)). The 7 new tools include the relations diagram method, matrix data analysis methods, PDPC (process decision program chart) method, and arrow diagram method (see Mizuno (1988)). Six of the 7 tools (not including the control chart) listed above are understood by every statistician, regardless of training, and by almost every person who sees them daily in the newspaper. Our experience confirms that much can be accomplished by using the 7 simple tools. These tools can be used by virtually any practicing statistician, any statistician, in-house or hired on a part-time basis from the teaching staff of a local college. Using control charts and guiding action based on an understanding of special and common causes are very important, but experience shows that enormous improvement can be achieved by conscientious people working with the 6 statistical tools and a clear understanding of how to use them to detect problems.

Another approach to implementing TQM is becoming increasingly popular. It was developed by the Air Force Human Resources Laboratory (AFHRL) and is recommended for use in the functional areas by Air Force Regulation 25-5 (Chapter 6) and used in a number of Air Force and Navy organizations. The approach is called the Methodology for Generating Efficiency and Effectiveness Measures, or MGEEM. Implementing TQM with MGEEM not only avoids the problems associated with the more common approaches, but provides a framework that greatly facilitates the adoption of Dr. Deming's philosophy and teachings. MGEEM also provides commanders and managers with a comprehensive performance measurement and information system that includes a number of powerful tools for improved management and increased worker morale. An explanation of how MGEEM facilitates TQM follows. However, the explanation will be more meaningful to readers who are familiar with these materials and with Dr. Deming's work. It is not meant to be a complete technical description of the implementation and use of MGEEM. This information is available in Tuttle and Weaver (1986a, b) and several unpublished manuscripts, Weaver and Looper (no date), and Weaver (no date), all available from AFHRL. In the following

explanation of how MGEEM implements TQM, references to Dr. Deming's 14 points (Deming, 1986, Chapter 2) are in parentheses.

MGEEM applies to organizational components at every hierarchical level, including the commander and staff, each division, each branch, and each function or work center. (Point 14. Put everyone to work to accomplish the transformation.) An in-house facilitator leads members of each component through a series of consensus-seeking exercises. (Point 8. Encourage two-way communications to drive out fear.) The MGEEM is tailored to each component based on inputs from members. First, component members establish or review the component's mission statement and may become involved in strategic planning. Reviewing the mission is important because Dr. Deming observes that probably 80% of America's workers don't know their job and are afraid to ask (Mann, 1985, p. 101). (Point 1. Create Constancy of Purpose.) Second, component members use input-output analysis to (a) identify internal and/or external customers, identify customer needs, and consider that quality is defined in terms of anticipating and satisfying customer requirements (Point 1. Create constancy of purpose.) and (b) identify suppliers and consider that the contribution of suppliers to quality goes beyond lowest price to include cooperation. (Point 4. End the practice of awarding business solely on the basis of price.) Third, component members break their mission statement into measurable parts, called key result areas (KRAs), and develop indicators which measure how well KRAs are being accomplished. Fourth, component members develop graphics, called mission effectiveness (ME) charts, through which they express their judgment about the relationship between feasible levels of performance on each indicator and the component's overall effectiveness. Performance results on ME charts are periodically (monthly) fed back to managers for improved leadership and to workers in feedback sessions to improve morale. Feedback sessions are among the most important part of MGEEM. Workers on "feedback teams" identify barriers to improvement on their ME charts, (Point 8. Encourage two-way communication to drive out fear.) and management takes action where appropriate on the recommendations of the feedback teams. (Point 12. Remove barriers that rob workers of their right to pride of workmanship.) (Point 5. Improve constantly and forever the systems of production and service.) (Point 7. Adopt and initiate leadership.) Remember that Dr. Juran estimates that 15% of organization problems can be corrected by the workers leaving management with the responsibility for improving the other 85% through changes in the system (Mann, 1985, p. 7). Removing barriers may involve training, (Point 6. Institute training on the job.) or may require greater coordination with other organizational components. (Point 9. Break down barriers between departments.) Managers who practice Dr. Deming's teachings do not use slogans, exhortations, targets (Point 10), work standards (quotas) (Point 11a), or management by objectives (Point 11b) to bring about improvements on ME charts. Instead they accept their responsibility to constantly and forever improve the systems in which they and their subordinates work (Point 5). Such managers realize that quality is built in the product or service by improving the processes that produced it, not adaptable and innovative workers are developed by education and self-improvement that extends beyond training for the skills required by their present jobs (Point 13).

Use of the MGEEM includes two versions of PATs. First, members of every organizational component receive monthly feedback on how they perform as a group on their ME charts. Members in every organizational component are a feedback team which is a PAT. There are permanent "feedback PATs" throughout the organization, and everyone is a member of a PAT (Point 14. Put everyone to work to accomplish the transformation.) As feedback PAT improve constantly and forever the system of production (Point 5), they recognize that some barriers to improvement extend beyond the boundaries of their component and authority. Such problems are worked by cross-functional teams, a second type of PAT, a "cross-functional PAT." Cross-functional PATs are initiated by management when a problem that extends across the boundaries of two or more organizational components is identified. (Point 9. Break down barriers between departments.) The membership of a cross-functional PAT includes an advocate from staff who represents the PAT to the commander, representatives from each functional component involved with the problem, a subject matter expert, and an action officer responsible for day-to-day measurement and reporting.

Neither of the MGEEM PATs use judgment to identify barriers or processes that require attention. Instead the slopes on ME charts provide this guidance. Poor performance (or barrier) on a steep slope should usually be worked before poor performance (or barrier) on a flat slope. Having ME charts throughout an organization reveals if changes to benefit one component have inadvertently caused harmful effects elsewhere.

Both types of MGEEM PATs use the Deming cycle to identify and solve/eliminate problems/barriers to performance. Members of both types of MGEEM PATs are trained in the use of the 7 tools (Ishikawa, 1982; Brassard, 1988) and Dr. Juran's (1988) PAT team techniques. MGEEM PATs are informed that 90% of problems can be worked successfully with simple statistical tools. They are, however, taught and encouraged to use control charts where appropriate and to apply Dr. Deming's perspective of special and common causes so that they don't tamper with a stable, predictable system.

Besides being a framework for implementing TQM, MGEEM provides commanders and managers with a comprehensive organizational performance measurement and information system which includes a number of powerful tools for improved management and increased worker morale. These additional benefits of the MGEEM surpass anything offered by other approaches to implementing TQM. The benefits are derived from use of the ME charts. MGEEM is an organizational performance measurement system because ME charts provide measures for managers and workers which allow them to monitor how well they are doing in accomplishing their KRAs. Furthermore, measures on ME charts can be rolled up so that higher level managers can monitor the overall performance of one or several units. The measures of performance used in the MGEEM go beyond the traditional measures available from accounting and engineering. It is these nontraditional measures, such as timeliness and customer satisfaction, that Dr. Deming says are so important. The MGEEM is an information system because, in addition to their measurement capabilities, ME charts provide signals that problems exist and that problems are solved. This, of course, makes PATs more effective because the charts

point to problem areas where PATs should be established. ME charts also measure the results of the PAT's efforts to correct problems. Furthermore, ME charts provide guidance on resource allocation. Activities with charts with steep slopes (indicating that the activity is important to effectiveness) are usually the first to benefit from new resources and the last to give resources up.

No approach to implementing TQM can guarantee the transformation of management urged by Dr. Deming. No approach can guarantee practice of the 14 points, avoidance of the deadly diseases, and overcoming the obstacles. However, the MGEEM provides a series of opportunities in which the Deming philosophy can take root and be practiced. With the MGEEM in place, however, it is necessary to institute a vigorous in-house program of education in Dr. Deming's philosophy and teaching. There are a variety of ways to conduct this education, but according to Dr. Deming, direct and continuous management involvement is necessary. Here are some suggestions about how to conduct this education. Each key manager, including the commander, could be tasked to read a variety of materials (see references) on one of the 14 points, deadly diseases, or obstacles and prepare a 30-minute briefing on it. These briefings should be video taped for viewing periodically at various meetings such as feedback sessions, working lunches, staff meetings, and commander's call. Showing of the tapes should be followed by round table or panel discussions. Other presentations by managers on other quality experts, such as Juran (1988) and Peters (1987), can be similarly arranged. Education on the Deming philosophy must be routinely included in all organization activities on a continuing basis.

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MGEEM: NEW METHODS OF MEASURING AND ENHANCING ORGANIZATIONAL PRODUCTIVITY

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The Air Force Human Resources Laboratory has recently completed a series of research projects resulting in a powerful new tool for measuring and enhancing organizational performance called the Methodology for Generating Efficiency and Effectiveness Measures or MGEEM. Through the efforts of a measurement facilitator, the MGEEM can be developed in from two hours (for a work center) to two days (for the headquarters of a major field activity). Organization members are guided through the MGEEM process to construct a comprehensive performance measurement system unique to their organization. This system encourages the creation of an organizational culture focused on quality by employing a variety of enhancements, such as those proposed by Deming (1986), Peters (1987), and Weaver (in progress), which continuously improve performance.

Used in a wide variety of Air Force and Navy organizations, MGEEM has significantly increased organizational performance, is highly acceptable to organization member/participants because the implementation process develops a sense of ownership, is cost effective in the sense that it creates little additional paperwork burden, satisfied commanders' need for a device which comprehensively measures organizational performance, makes possible vastly improved management, increases morale, and is easy to understand and use. The MGEEM, a multistep procedure, is a unique combination of technologies designed especially for these purposes.

The decision to use the MGEEM requires strong commitment and continual visible support of the commander of the target organization to the measurement and enhancement of performance. Implementation requires the effort of a measurement facilitator, generally external to the organization, who is skilled in group process activities (e.g., running meetings, facilitating group discussions, listening, and bringing about consensus) one who understands the basics of organizational performance measurement. After becoming familiar with the target organization through existing documentation, such as the mission statement, organization structure charts, work center descriptions, and conversations with organization members in a site visit, the facilitator begins the MGEEM process by convening Team A. Team A is composed of the commander of the target organization, immediate subordinates, and representative customers. The facilitator leads this team through an input-output systems analysis so that everyone understands the target organization in terms of its suppliers, inputs, mission, value adding activities, outputs (products), and customers. Customers use the outputs of the target organization to accomplish their missions; they may be separate organizations or other branches, divisions, etc., of the same organization.

The facilitator continues the MGEEM process by asking members of Team A to assume that they are commander for a day. He then poses to Team A the question, "What does the Air Force (or Navy or whatever is appropriate) pay this organization to accomplish?" Answers are clarified and prioritized using the nominal group technique (NGT), a structured process for bringing about consensus. The results, called key result areas (KRAs), are the principal intended accomplishments of the organization. Development of from 5 to 7 KRAs concludes the work of Team A. Next, Team B is formed of the commander's subordinates and key workers. Members of Team B are also asked to play commander for a day. The facilitator shows Team B each KRA, in turn, and asks what the commander needs to know to evaluate how well the organization is doing on each. Answers, called indicators, are again clarified and prioritized using the NGT. For each KRA there is usually one to three indicators. Examples of KRAs and indicators are shown in Table 1. Thus, in the first stage in the MGEEM process, a measurement system of KRAs and indicators is developed by organization members with the assistance of a facilitator.

TABLE 1. EXAMPLES OF KRAs AND INDICATORS

<u>Organization</u>	<u>KRA</u>	<u>Indicator</u>
Jet Engine Repair Shop	To keep engines in ready/serviceable condition	Percent of inspections passed
Warehouse	Make deliveries in a prompt/timely manner	Minutes required to deliver priority items
Engineering	To complete projects on time	Percent of suspenses met

Continuing its involvement, Team B moves into the second stage of the MGEEM by constructing graphical representations of the relationship between performance on each indicator and overall organizational effectiveness. These representations of team consensus are called mission effectiveness (ME) charts and display not only current levels of performance, but also show where the organization can improve planning, identify productivity constraints, and increase morale and productivity through feedback and goal setting. An ME chart is developed for each indicator and takes into account that some indicators are more important than others. The facilitator begins ME chart construction by guiding Team B to a consensus about the feasible worst and best values possible for each indicator and labels the X-axis with the name of the indicator, placing the worst feasible performance value on the left and the best feasible performance value on the right. For instance, the X-axis label of feasible worst and best values for the indicators in Table 1 could be: (1) for inspections passed, from 40 to 100 percent; (2) for time required to deliver priority items, 0 to 15 minutes, and (3) for percent of suspense dates met, 65 to 95 percent. The Y-axis is

overall mission effectiveness labeled from -100 at the bottom through 0 to +100 at the top in increments of 10. These best and worst values constitute the first two points on the curve on an ME chart. Figure 1 shows the standard form of an ME chart.

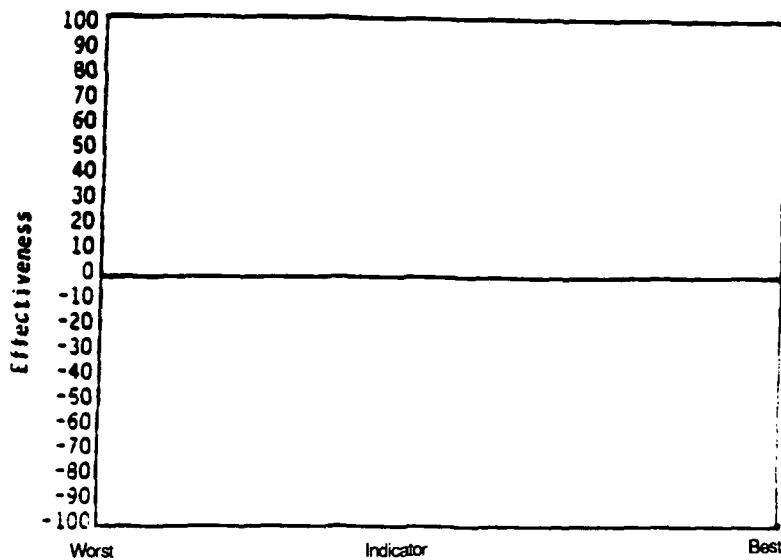


Figure 1. Standard form of an ME chart.

The facilitator then poses questions to Team B which produce a third point on the ME chart for each indicator: "What is the level on this indicator (X-axis) that has no impact on organizational effectiveness (Y-axis)?" or, "What level of performance won't rock the boat?" Another way to put this question is "What level of performance on this indicator won't cause management to commit more resources or reduce resources?" This answer on the X-axis is the zero point on the Y-axis. The facilitator continues the questioning by asking the impact on effectiveness of other levels on the indicator until the relationship between the indicator and effectiveness is captured. Curves on ME charts can be linear or nonlinear and reflect consensus of Team B concerning the impact on mission effectiveness of different levels of performance on indicators. ME charts are submitted for review and approval to higher management.

The organization's performance for each indicator is provided monthly to managers to improve planning and leadership, and to workers in "feedback sessions" to encourage discussion about how to improve performance on the key indicators, including identifying constraints to increased performance. In feedback sessions to improve production methods, management must take suggestions seriously. Workers produce outputs and managers work continuously to improve the system. This relationship may require a new philosophy of leadership at all levels. Feedback motivates both workers and management to higher levels of performance; then managers can work continually to improve the work process.

Figure 2 shows two completed ME charts.

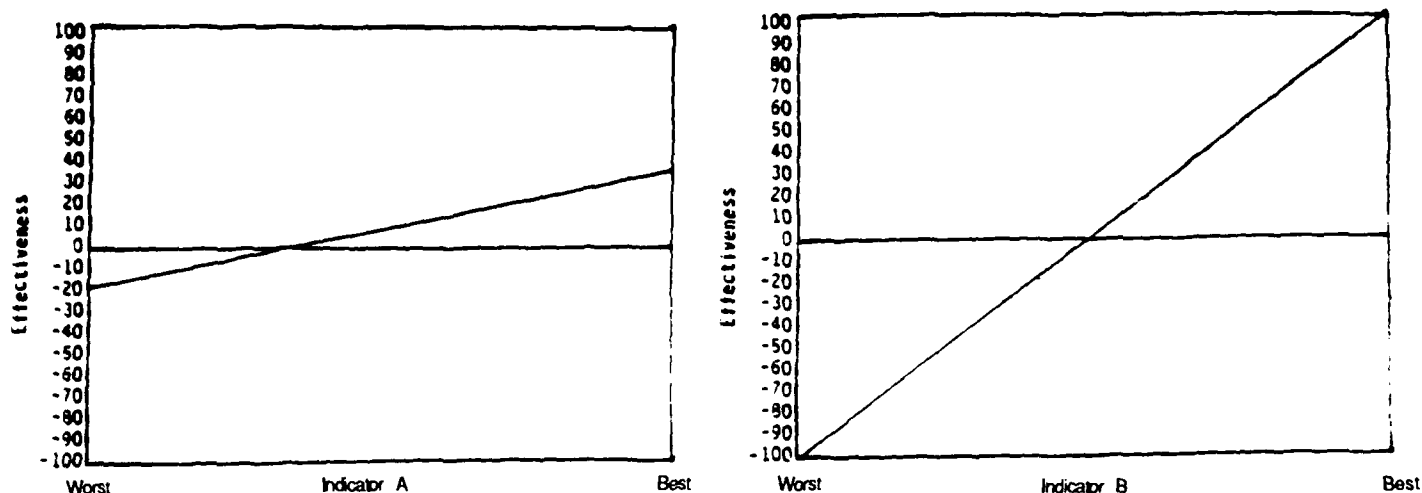


Figure 2. Completed ME charts.

These charts represent the impact on mission effectiveness (overall organizational performance) of two indicators. Which indicator is more important to the accomplishment of the mission? The answer is Indicator B because the slope on its ME chart is steeper. Steep slopes mean that changes in performance have great impact on the mission. Suppose an organization is performing to the far left on the horizontal axes of both ME charts in Figure 2. Where should the manager of this work center devote effort and resources to get the greatest positive impact on mission? Again, because of the steeper slope, the answer is Indicator B. This kind of analysis provides many other advantages, such as the early warning of problems and their progress toward resolutions.

Since ME charts transform indicators to the common scale of effectiveness (the Y-axis), effectiveness points from ME charts can be summed to measure a work center's overall performance; different work centers can be directly compared; and work centers can be aggregated to measure the overall performance of the higher level organization. ME charts updated monthly and displayed in work areas reveal the worker's impact on overall effectiveness. Also, workers know how their level of effort compares with what is expected. Over time, they see the result of increased or decreased efforts. Beyond feedback, curves on ME charts can be used to set goals. Transforming metrics and preparing reports for management and workers can be accomplished with the target organization's existing data automation system.

Air Force Regulation 25-5 requires every Air Force functional area to have an adequate management information system. The MGEEM is incorporated in the Performance Measures Document (PMD) of this regulation as the *recommended* measurement component. A number of field activities of Navy Air Systems Command,

including the Naval Plant Representative Office (NAVPRO) at McDonnell-Douglas Corporation and the Naval Air Test Center, have begun MGEEM implementations.

AFHRL has training manuals (such as the Tuttle & Weaver, 1986, and Weaver and Looper, in press) and videos available for field use of the MGEEM. The points of contact on the MGEEM at AFHRL are Mr. Larry Looper at (512) 536-3942 and Dr. Charles N. Weaver at (512) 536-3551.

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MANAGING WITH MGEEM

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Brooks Air Force Base, Texas

Air Force Regulation 25-5 (May 1988) requires every Air Force functional area to have an adequate management information system (MIS); this requirement is reviewed during the functional review process. The Methodology for Generating Efficiency and Effectiveness Measures (MGEEM) is incorporated into the Performance Measures Document (PMD) of AFR 25-5 (Chapter 6) as the recommended measurement component. The MGEEM is a comprehensive MIS which makes possible improved leadership, enhanced motivation, and the continual improvement of the way work is conducted. MGEEM implements the principles of Total Quality Management (TQM).

HRL has published technical reports (Tuttle & Weaver, 1986; Weaver & Looper, in press) explaining how to build an MGEEM system. There is need, however, for guidance to workers, supervisors, and commanders on how to use an MGEEM system once it exists in their organization. HRL is completing a technical report on MGEEM guidance of which this paper is an overview.

For illustration, assume a certain Security Policy work center has an MGEEM system with two key result areas (KRAs), "To protect base resources" and "To document security actions." For each KRA, there is one indicator. For protecting base resources, the indicator is "number of reportable incidents" and for documenting security actions the indicator is "percent of reports completed on time." (Number of reportable incidents is the absolute number, and percent of reports completed on time is the number of reports completed on time divided by the number of reports required x 100). Mission effectiveness (ME) charts for these two indicators are shown in Figure 1.

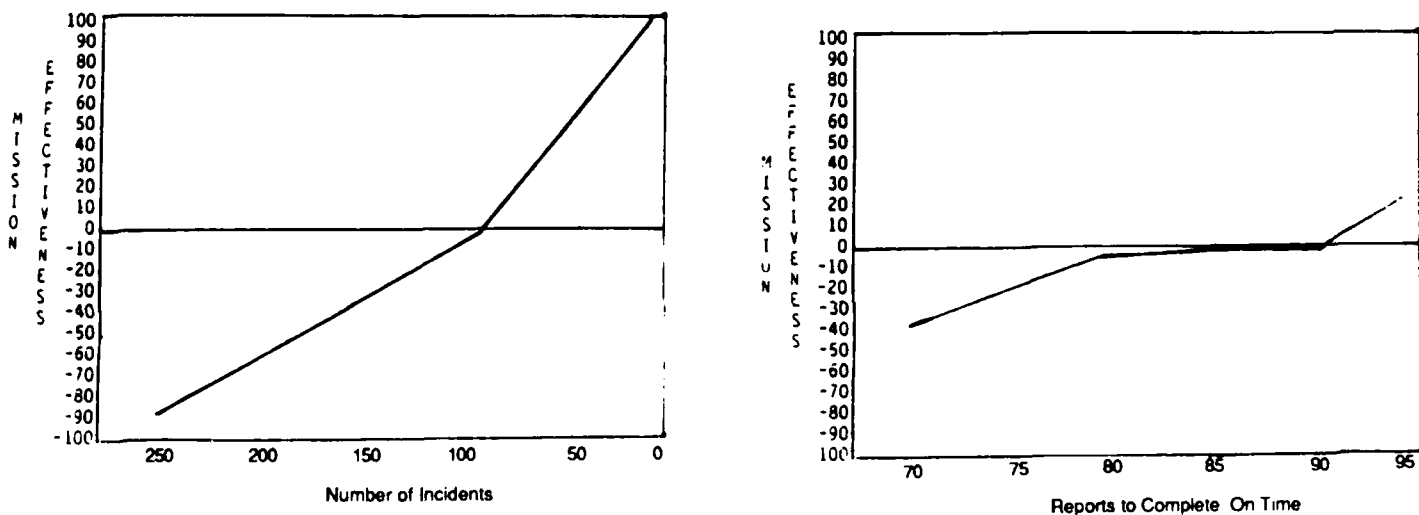


Figure 1. Mission effectiveness charts.

MGEEM as an MIS. The MGEEM provides much useful information about; the operation of the work center. For instance, KRAs show that the mission of the work center is to protect base resources and to document security actions. Indicators measure the work center's performance in accomplishing the KRAs. There is one ME chart for each indicator showing the relationship between levels of performance on indicators (on the horizontal axis) and the work center's overall mission effectiveness (on the vertical axis). Slopes on ME charts show the importance of indicators: flat slopes mean indicators are less important than indicators with steep slopes. For instance, the slopes on the ME charts in Figure 1 indicate that the number of incidents is more important to mission effectiveness than reports completed on time. When the work center performs as well as feasible on both indicators, "no incidents" has a +100 impact on mission effectiveness while "completing 95% of reports on time" has only a +20 impact on mission. Thus, comparing the slopes on the two ME charts shows policy about the importance of the two indicators: controlling incidents is more important than completing reports on time. This is not to say that the work center can neglect completing reports on time. Completing less than 85% of reports on time has a negative impact on mission effectiveness, but it is not so serious as a high number of incidents. Furthermore, when the work center completes as many reports on time as feasible (95%), it only has a moderately positive effect on mission effectiveness (+20).

As the work center strives to improve, ME charts provide feedback on how successful the work center has been. Each month the results of performance on the indicators are recorded on ME charts and provided to the supervisor and workers and posted on bulletin boards in the work centers for all to see. Suppose, for instance, that last month's performance on the two indicators in Figure 1 was 50 incidents and 80% of reports completed on time. These results are posted (In Figure 2 with a letter representing the month. Here the letter O is for October.) on ME charts and provided as feedback to the supervisor, NCOs, and enlisted personnel. These results show that the work center is doing well on the most important aspects of its business, protecting base resources. A 50 on number of incidents (on the horizontal axis) translates into a +45 effectiveness point (on the vertical axis) and shows that there is room for improvement but, in general, that things are going well on this indicator.

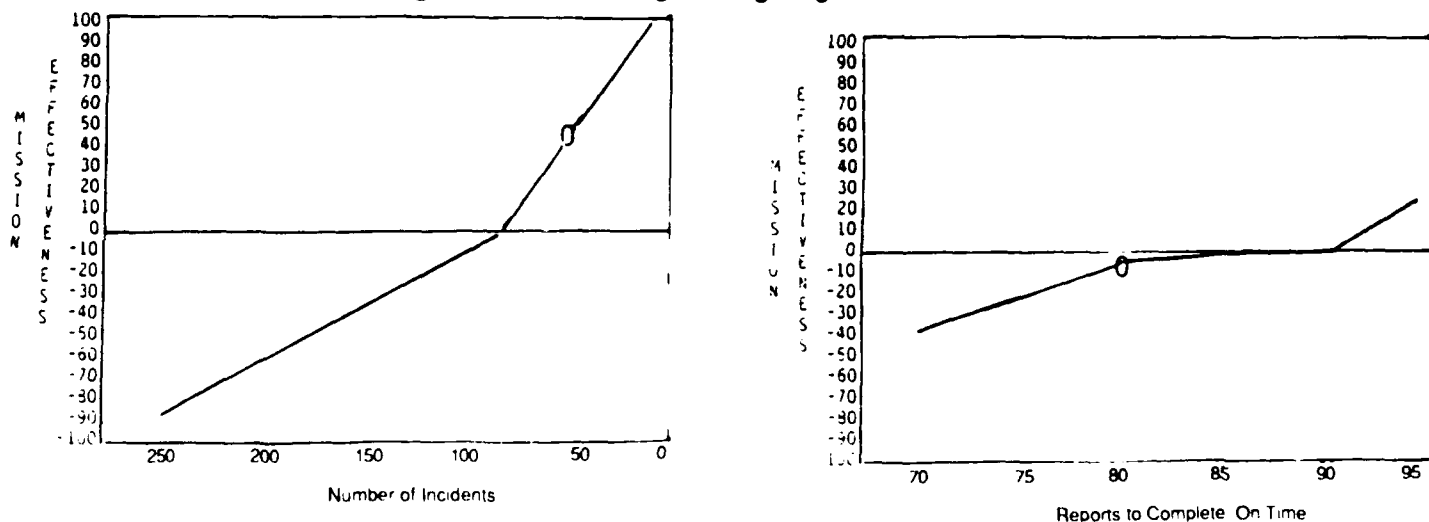


Figure 2. One month's performance.

On the second indicator, however, 80% of reports completed on time shows that the second important aspect of business, documenting security actions, is not being accomplished very well. Completing 80% of reports (on the horizontal axis) has a negative impact of about -10 on mission effectiveness (on the vertical axis). With this information, the supervisor and workers should discuss, evaluate, and employ initiatives for improvement. At the end of the month following such initiatives, performance results are again added to the ME charts and provided to the supervisor, NCOs, and enlisted personnel. The new results are indicated on the ME charts with another letter, here N for November, so that current period performance can be compared against the performance of the previous period(s). With an MGEEM system in place the supervisor can monitor work center performance from month-to-month to track the results of management initiatives and other influences, such as inspections and deployments. Of course, efficiency (outputs divided by inputs) should also be considered in managing work centers.

Another part of the MGEEM MIS, a summary of the performance of the work center, can be rolled up monthly to each level of supervision on an MEP chart. This information provides a quick overview of work center performance. Overall work center effectiveness (the sum of the current period's vertical-axis effectiveness scores on each ME chart) for a given period (one month or the average of several months) is defined as 100 and plotted on an MEP chart. In this case the effectiveness scores as 45 (for 50 incidents) and -10 (for 80% reports completed on time) are added together to 35; this number is defined as 100 on an MEP chart. See Figure 3.

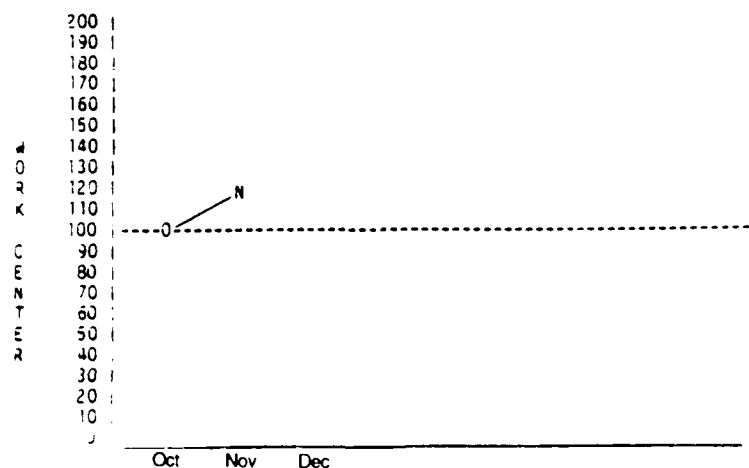


Figure 3. Example MEP chart.

Subsequent month's effectiveness scores are made relative to the baseline of 100 by dividing the current period effectiveness score by the baseline period effectiveness score and multiplying by 100. For instance, if the next month's effectiveness score is 40, the new point on the MEP chart is 114 ($40/35 \times 100$). See Figure 3.

Improved Leadership. Before an MGEEM system becomes operational (or modified after a period of use) it is coordinated with the squadron commander. This coordination preserves traditional respect for the work center supervisor's judgment and experience. The squadron commander should assure that coordination on the MGEEM system strengthens the bond with work center supervisors. The squadron commander should be a model of good leadership to work center supervisors and NCOs. Good leadership for all levels is not based on micromanagement with quotas, suspense dates, and fear. It should be based on a coaching, team building, teaching relationship.

After the MGEEM system has been approved, it provides the supervisor with a number of management tools. For instance, consider the ME charts in Figure 2 where the letters represent current performance. Is it better to manage the work center to maintain or reduce "number of incidents" or to increase "reports completed on time?" The slope of the charts shows that the greatest payoff to effectiveness is in maintaining or reducing incidents. Reports cannot be neglected, but the ME charts show that they are not so important as incidents to the mission. What happens when the month-to-month results posted on an ME chart go in the wrong direction? This trend, of course, means there is a problem somewhere. Work center morale and cohesion is improved when supervisors solicit ideas about the problem from all work center personnel in "feedback sessions" (described below). Instead of seeking to blame someone when a problem is detected, supervisors should focus on improving the way work is conducted. Supervisors must listen. They should seek to solve problems together with workers. They should seek more data and analyses about the problem, depending less on judgment and guesswork. They shouldn't be hurried, taking more time for precision and care. They should solicit worker's ideas about constraints to higher performance. Supervisors should say, "What can I do to help you achieve excellence? What can I do to help you lead a better work center?"

Enhanced Motivation. The most important motivational feature of the MGEEM system is monthly "feedback sessions." As soon as current monthly performance results are posted on ME charts, the charts should be provided to the work center supervisor. As soon as the charts are available they should be distributed at monthly meetings of key work center personnel. The supervisor and NCOs should be present throughout the meeting, along with other members of the work center. (In a large work center other personnel should attend on a rotating basis, say every other month.) Everyone should have frequent opportunities to attend and get in their "2 cents worth." No member of the work center should be left out of the feedback sessions. At these meetings the supervisor should encourage feedback about how to improve work center performance as measured on ME charts. The supervisors and NCOs should listen to the reactions and suggestions of enlisted personnel. Enlisted personnel should be asked, "What keeps you from doing a better job? What holds you back?"

Remember that the work center is a team. In the feedback sessions, team building and teamwork should be encouraged. Supervisors should not look for someone to blame for a performance problem, but should seek to figure out ways to improve the work processes involved. Supervisors must understand that the vast majority of personnel want to do a good job. They want to take pride in their work. Experience shows that some inadequacy in the management systems is usually the real cause of a performance problem. For instance, is everyone adequately trained? Is there enough time to do a good job? Are supplies and materials appropriate and available? Are instructions clear? Is supervision supportive and encouraging? Has time been taken to build morale and esprit de corps? Do the managers at every level take the time to listen to their subordinates? Is self-improvement encouraged among subordinates?

Continually Improving the Way Work is Conducted. In feedback sessions the supervisor should lead a discussion of how to make things better: "How can we improve on our ME charts? What's holding us back from greater excellence?" As explained above, experience shows that most performance problems result from inadequacies in the way the work center does its business, not from people unwilling to work hard. It is, therefore, almost always a waste of time to expect to get lasting gains in performing by exhorting subordinates to work harder. Most personnel are already working at their limit. Many already work 10-12 hours a day. To ask them to work more hours is an insult to them and an unnecessary burden on their families. Rather than asking them to work harder, supervisors must accept responsibility for simplifying and streamlining the way the work is done. It is the responsibility of managers to figure out how their people can work smarter, not harder, to accomplish the mission. The key question is, of course, how do we work smarter, rather than harder?

Evidence shows that working smarter rather than harder is the result of a certain management philosophy and a number of specific initiatives. The philosophy already identified above is, that rather than exhorting subordinates to work harder, managers should accept the responsibility to improve the way work is conducted. First, supervisors accept MGEEM ME charts as measures of how well the work center mission is being accomplished. They hold monthly feedback sessions with subordinates to study the charts and "brainstorm" ideas on how to improve performance. Subordinate input is valued and encouraged. The focus is not on finding someone to blame for problems, but on how to improve the way business is conducted. Second, squadron commanders and supervisors are willing to experiment with new ideas that have potential for simplifying and streamlining the work. They authorize the implementation of new ideas on a test basis and evaluate the impact of the test with their ME charts. They are willing to "write off" several failures to get to one winning idea that significantly improves work center performance. They, of course, coordinate the implementation of new ideas and utilize existing Air Force change programs, including the Model Installations Program (MIP), the Suggestion program (SUG), and Management Decision Package (developed during functional reviews). Managers should read and reread any books by TQM experts such as Deming, Juran, and Peters.

In an organizational climate of harmony and respect, the MGEEM provides an MIS which makes it possible to enhance motivation and to improve leadership and

the continual improvement of the way work is conducted. Experience shows that use of the MGEEM as the PMD MIS improves morale and increases organizational performance.

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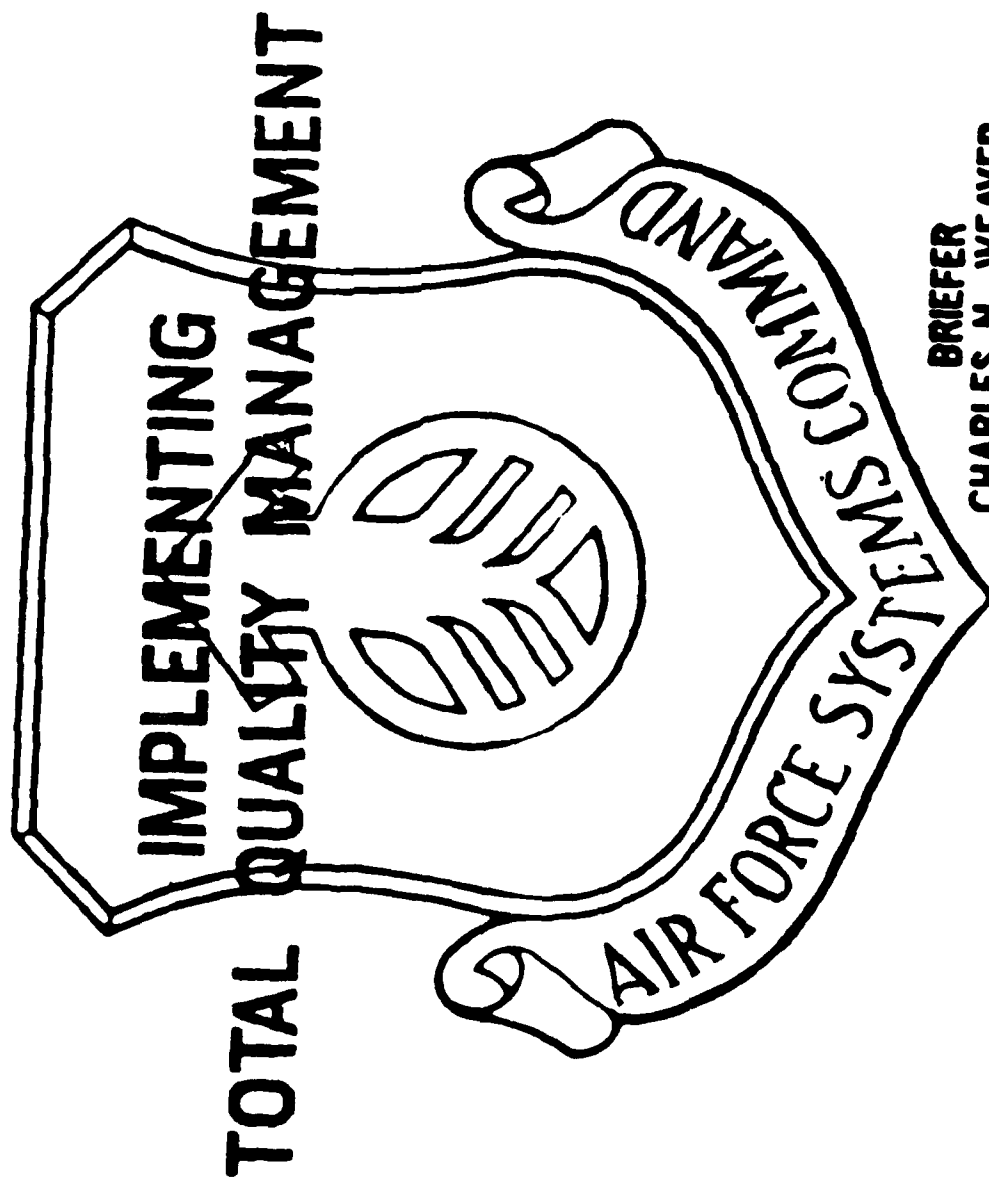
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Weaver, C. N., and Looper, L. T. Methodology for generating efficiency and effectiveness measures (MGEEM): A guide for the development and aggregation of mission effectiveness charts. Brooks AFB, TX: Manpower and Personnel Division, Air Force Human Resources Laboratory (AFHRL-TP-89-7; AD-A208 353.)

APPENDIX A
TQM BRIEFING SLIDES



BRIEFER
CHARLES N. WEAVER



INTRODUCTION

- **CRISIS OF QUALITY IN U.S.**
 - PRODUCTS
 - CUSTOMER SERVICE
- **LARGER VIEW NEEDED: TOTAL QUALITY MANAGEMENT**
 - TRANSFORM U.S. MANAGEMENT STYLE
 - CUSTOMER FOCUS
 - MORE MEASUREMENT
 - CONTINUAL IMPROVEMENT



TQM DEFINITION

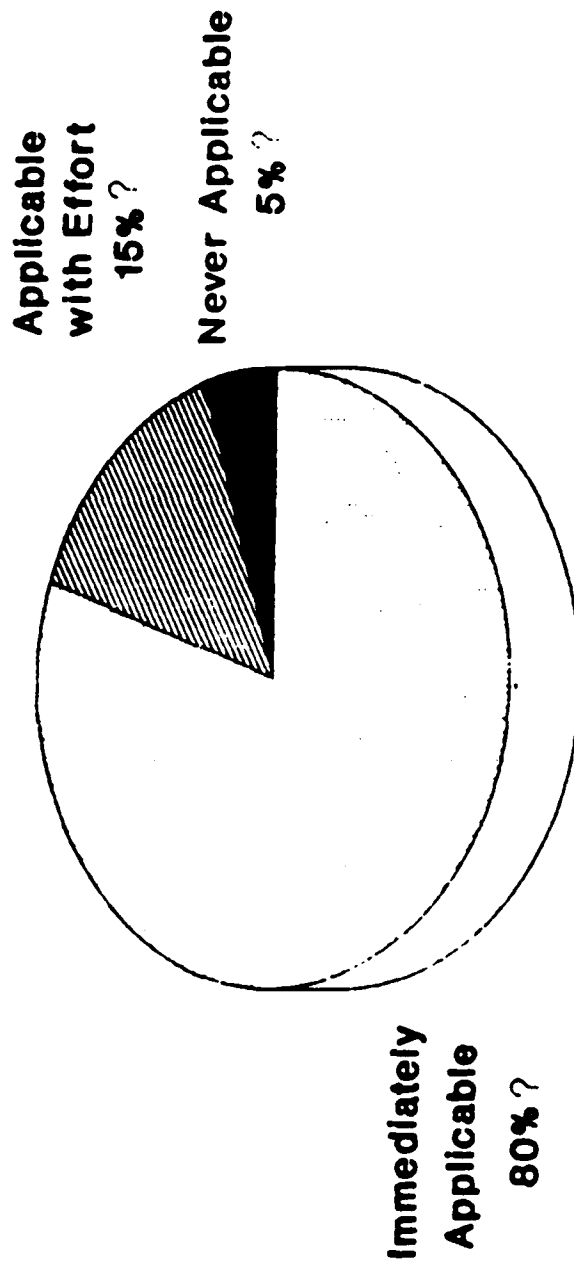
**TQM IS A PARTICIPATIVE MANAGEMENT
STYLE WHICH FOCUSES ON MEETING
CUSTOMER EXPECTATIONS BY
CONTINUALLY IMPROVING THE PROCESSES
BY WHICH WE DO BUSINESS**



TQM KNOWLEDGE

- **MANY GURUS AND DISCIPLES**
- **COTTAGE INDUSTRY**
- **EXPENSIVE**
- **PRIVATE SECTOR, MANUFACTURING MODEL**
- **NO SATISFACTORY TRANSLATION TO DOD**

TQM Translation to DoD





W. EDWARDS DEMING

- TRANSFORM WESTERN MANAGEMENT STYLE
 - 14 POINTS
- HEAVY RELIANCE ON STATISTICS
- ENCOURAGES "CRITICAL MASS" OF MANAGERS
- ENDORSES USE OF TEAMS



J.M. JURAN

● THEORY

- LITTLE Q AND BIG Q
- JURAN TRILOGY
- ALLIGATOR HATCHERY
- TRIPROL CONCEPT

● APPLICATION

- QUALITY COUNCILS
- PROJECT-BY-PROJECT IMPROVEMENT
- PROJECT IMPROVEMENT TEAMS



TOM PETERS

- **CASE HISTORIES**
- **FLAMBOYANT AND ANECDOTAL**
- **FOCUS**
 - PARTICIPATORY MANAGEMENT
 - IMPROVING CUSTOMER SERVICE



PHILIP B. CROSBY

- **CONFORM TO REQUIREMENTS**
- **USE PREVENTION SYSTEMS, NOT APPRAISAL SYSTEMS**
- **MEASURE QUALITY AS THE PRICE OF NONCONFORMANCE**
- **DO IT RIGHT THE FIRST TIME**



METHODOLOGY FOR GENERATING EFFICIENCY AND EFFECTIVENESS MEASURES (MGEEM)



APPLICATIONS

QUALITY ASSURANCE	COMBAT ARMS TRAINING/MAIN
FLIGHT SYSTEMS TEST AND EVAL	PASS AND REGISTRATION
ORDINANCE SYSTEMS TEST AND EVAL	INFORMATION SECURITY
SUPPLY	OPERATIONS
AVIONICS	TRAINING
TRANSPORTATION	ARMAMENT AND EQUIPMENT
CONTRACTING	MILITARY WORKING DOG PRO
JUDGE ADVOCATE	CONFINEMENT (DETENTION CTR)
BUDGET	INVESTIGATIONS
ACCOUNTING AND FINANCE	LAW ENFORCEMENT FLIGHTS
CIVILIAN PERSONNEL	SECURITY POLICE FLIGHT
MAINTENANCE	HEADQUARTERS STAFF
PUBLIC WORKS	R&D
WEATHER	CIVIL ENGINEERING
ADMINISTRATION	
COMMISSARY	
AERO/MECH ENGINEERING	
AVIONICS/ELEC ENGINEERING	
AIRCRAFT SUPPORT ENGINEERING	
ASTRONAUTICS SUPPORT ENGINEERING	
LIAISON/TECH DATA REVIEW ENGINEERING	



MGEEM IMPLEMENTATION

- AF REGULATION 25-5
- AF SYSTEMS COMMAND
 - HSD
 - CMD
- OTHER SERVICES



MGEEM OVERVIEW

- **Phase One**
 - Quality Council
- **Phase Two**
 - Mission Statement
 - Customers
 - Suppliers
- **Phase Three**
 - KRAs
 - Indicators
 - ME Charts
- **Phase Four**
 - Feedback Sessions
 - PATs



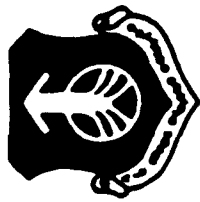
MGEEM: PHASE ONE

- **Quality Council**
 - **Commander and staff/other key levels**
 - **Policy**
 - **Education**
 - **Time/Resources**
 - **Review/Coordination**
 - **Recognition/Reward**



MGEEM PLAYERS

- **Quality Council**
 - Commander and Staff
- **Facilitator**
- **Blue Team**
 - Manager of Target Organization
 - Manager's Superior
 - Manager's Immediate Subordinates
 - Representative Customers / Suppliers
- **Green Team**
 - Manager's Immediate Subordinates
 - Key Workers
- **Feedback PAT**
 - All Target Organization Personnel
 - "Vital Few" Customers / Suppliers
- **Cross-Functional PAT**
 - Vertical / Horizontal Linkage
 - Subject Matter Expert
 - Action Officer



MGEEM: PHASE TWO

- **Mission Statement**
- **Customers**
- **Suppliers**



AFHRL MISSION STATEMENT

THE AFHRL MISSION IS RELATED TO ALL FUNCTIONAL AREAS OF THE AIR FORCE SINCE THERE IS NO AREA THAT ESCAPES THE REQUIREMENT FOR TRAINED AND QUALIFIED PERSONNEL. THE LABORATORY EXECUTES ITS MISSION THROUGH R&D PROGRAMS IN TRAINING, PERSONNEL, AND LOGISTICS SYSTEMS TECHNOLOGY. THESE INCLUDE PROGRAMS IN FORCE SELECTION, CLASSIFICATION, AND UTILIZATION; PROGRAMS IN EDUCATION AND TECHNICAL TRAINING, FLYING TRAINING, AND TEAM TRAINING; PROGRAMS TO DEVELOP SIMULATORS FOR FLIGHT AND MAINTENANCE TRAINING; AND LOGISTICS AND HUMAN FACTORS PROGRAMS IN WEAPON SYSTEMS ACQUISITION.



INFORMATION SCIENCES DIVISION (ISD) MISSION STATEMENT

THE INFORMATION SCIENCES DIVISION SUPPORTS LABORATORY STAFF OFFICES AND DIVISIONS BY PROVIDING DATA PROCESSING SERVICES, MANAGING THE LABORATORY SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM, AND DEVELOPING MANAGEMENT INFORMATION SYSTEMS. THE DIVISION OPERATES A CENTRAL COMPUTER FACILITY AND COORDINATES THE PLANNING AND APPROVAL OF COMPUTER SYSTEMS WITHIN THE LABORATORY.

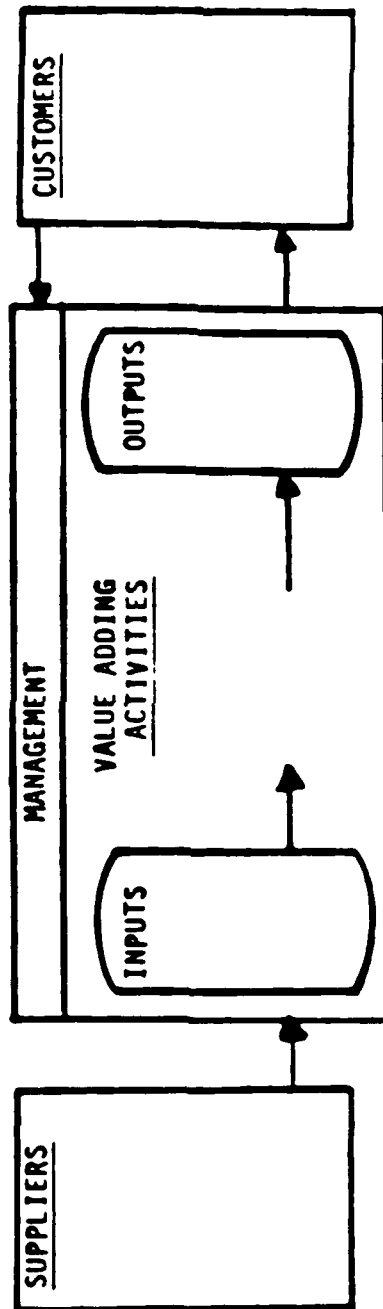
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CUSTOMER/SUPPLIER NOMINAL QUESTIONS

- **"WHAT IS A CUSTOMER?"**
- **"WHO ARE THE CUSTOMERS OF ... ?"**
 - VITAL FEW AND TRIVIAL MANY
- **"WHAT IS A SUPPLIER?"**
- **"WHO ARE THE SUPPLIERS OF ... ?"**
 - VITAL FEW AND TRIVIAL MANY

SYSTEMS DIAGRAM





MGEEM: PHASE THREE

- **KRAs**
- **Indicators**
- **ME Charts**



KRA NOMINAL QUESTION

"WHAT CATEGORIES OF RESULTS IS THIS ORGANIZATION EXPECTED TO ACCOMPLISH?"



CHARACTERISTICS OF GOOD KRAs

- **BREAK MISSION INTO MEASURABLE PARTS**
- **MUST SUCCEED, MAKE OR BREAK AREAS**
- **OUTPUTS, NOT INPUTS**
- **ENDS, NOT MEANS**
- **RESULTS, NOT ACTIVITIES/PROCESSES/TOOLS**



HRL KEY RESULT AREAS (KRAs)

- **STATE-OF-THE-ART TRAINING ANALYSIS, DESIGN, DELIVERY MANAGEMENT AND EVALUATION TECHNIQUES**
- **STATE-OF-THE-ART PERSONNEL MANAGEMENT TOOLS AND SUPPORTING MATERIALS**
- **TECHNICAL INFORMATION FOR THE WEAPON SYSTEM ACQUISITION PROCESS**
- **HUMAN/INFORMATION SYSTEMS INTEGRATION TECHNIQUES**
- **MAINTENANCE AIDING METHODS**
- **MODELING, SIMULATION, AND DECISION SUPPORT TECHNIQUES**
- **PERFORMANCE MEASUREMENT TECHNIQUES**
- **AUTOMATED RM&S SYSTEMS ENGINEERING/DESIGN TECHNIQUES**
- **VISUAL RESEARCH**
- **RESEARCH DATA BASES (DATA BASE LIBRARY FUNCTIONS)**



INFORMATION SCIENCES (SC) KRA5

- 1. STATISTICAL AND DATA PROCESSING PRODUCTS**
- 2. SOFTWARE: COMPUTER PROGRAMS AND DOCUMENTATION**
- 3. COMPUTER SERVICES**
 - OFFICE AUTOMATION
 - R&D COMPUTER SUPPORT
 - MIS COMPUTER SUPPORT
- 4. PROVIDE ADP TECHNICAL ASSISTANCE AND CONSULTATION**
- 5. HISTORICAL DATA BASES AND LAYOUTS**
- 6. MANAGEMENT INFORMATION SYSTEMS**
 - HRMIS
- 7. GRAPHICS SUPPORT**
- 8. REVIEW/STAFF/PLAN ADP REQUIREMENTS**
 - BISP
 - CSRD



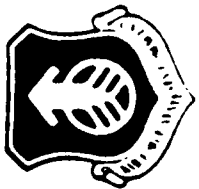
INDICATOR NOMINAL QUESTION

**"WHAT QUANTITATIVE INDICATORS SHOULD THE
MANAGER OF TRACK ON A PERIODIC BASIS
TO TELL WHETHER THE KRA IS BEING
ACCOMPLISHED?"**



CHARACTERISTICS OF GOOD INDICATORS

- **IMPORTANT**
- **EASILY UNDERSTOOD**
- **CONTROLLED BY FUNCTION'S ACTIONS**
- **EVALUATE CHANGE**
- **COST EFFICIENT**
- **REFLECTS EFFICIENCY AND EFFECTIVENESS**



TYPES OF INDICATORS

- **EFFICIENCY** $\frac{\text{OUTPUT}}{\text{INPUT}}$ (LABOR, CAPITAL & MATERIAL IN \$)
- **EFFECTIVENESS**
 - QUALITY (RETURN RATE, ERRORS)
 - TIMELINESS (CUSTOMER WAITING, DELIVERY TIME)
 - READINESS
 - ACCURACY
 - SECURITY
 - MAINTAINABILITY
 - RELIABILITY
 - SURVIVABILITY
 - MOBILITY
 - SUSTAINABILITY
 - CUSTOMER SATISFACTION



KRA/INDICATOR EXAMPLES (CONT)

- **KRA: PROVIDE HIGH QUALITY WORKING LIFE
FOR PERSONNEL**

INDICATORS:

- **NUMBER OF GRIEVANCES FILED**
- **QUALITY-OF-LIFE INITIATIVES**
- **MORALE**
- **TURNOVER RATES**
- **RECOGNITION/REWARDS**
- **SUGGESTIONS SUBMITTED**
- **SICK LEAVE RATES**



KRA/INDICATOR EXAMPLES (CONT)

- **KRA: PROVIDE QUALITY/TIMELY SUPPORT TO CUSTOMERS**

INDICATORS:

- **SUSPENSES/DEADLINES MET**
- **ON-TIME DELIVERIES**
- **REJECT/REWORK RATE**
- **CUSTOMER OPINIONS (SURVEY/CONVERSATIONS)**
- **LETTERS OF APPRECIATION/RECOGNITION**
- **TIME SPENT BY LINE PERSONNEL WITH CUSTOMERS**



HRL INDICATORS

- PLANNED MANHOUR/TOTAL MANHOURS IN LAB
- PROGRAMMED MISSION 3/TOTAL LAB PROGRAMMED MISSION CURRENT FISCAL YEAR
- PUBLICATIONS
- PRESENTATIONS/BRIEFINGS 06+
- RATIO OF PROGRAM MILESTONES MET/SCHEDULED
- DIVISION CHIEF CUSTOMER SATISFACTION RATING
- TECHNICAL DIRECTOR QUALITY TESTS
- OBLIGATION RATE
- EXPENDITURE RATE



INFORMATION SCIENCES DIVISION (SC)

KRA AND INDICATOR EXAMPLES

KRA #1: STATISTICAL AND DATA PROCESSING PRODUCTS

INDICATORS:

- TIMELINESS
- CUSTOMER SATISFACTION
- ACCURACY
- MEET USER REQUIREMENTS

KRA #2: SOFTWARE, COMPUTER PROGRAMS AND DOCUMENTATION

INDICATORS:

- CUSTOMER SATISFACTION
- PROBLEM RESOLUTIONS
- TIMELINESS

KRA #3: COMPUTER SERVICES

INDICATORS:

- CUSTOMER SATISFACTION
- UP TIME
- PROBLEM RESOLUTION

KRA #4: HISTORICAL DATA BASES AND LAYOUTS

INDICATORS:

- CUSTOMER SATISFACTION
- TIMELINESS
- QUALITY



EXAMPLES OF ENGINEERING KRA/INDICATORS

KRA: ASSIST IN EVALUATION AND MAKE RECOMMENDATIONS FOR ACCEPTANCE OR REJECTIONS OF WAIVERS AND/OR DEVIATIONS.

INDICATORS:

- **APPROVE/DISAPPROVE MINOR REQUESTS FOR DEVIATION (RFD) ON DD1694 FORMAT**
- **APPROVE/DISAPPROVE MINOR RFDs ON MDC TEMPORARY REQUIREMENTS CHANGE PROPOSAL/CONFIGURATION CHANGE PROPOSAL (RCP/CCP) FORMAT**
- **APPROVE/DISAPPROVE MINOR RFDs ON MDC AUTHORITY FOR MATERIAL SUBSTITUTION (AMS) FORMAT**
- **APPROVE/DISAPPROVE MINOR RFDs ON MDC DRAWING VARIATION (VAR) FORMAT**

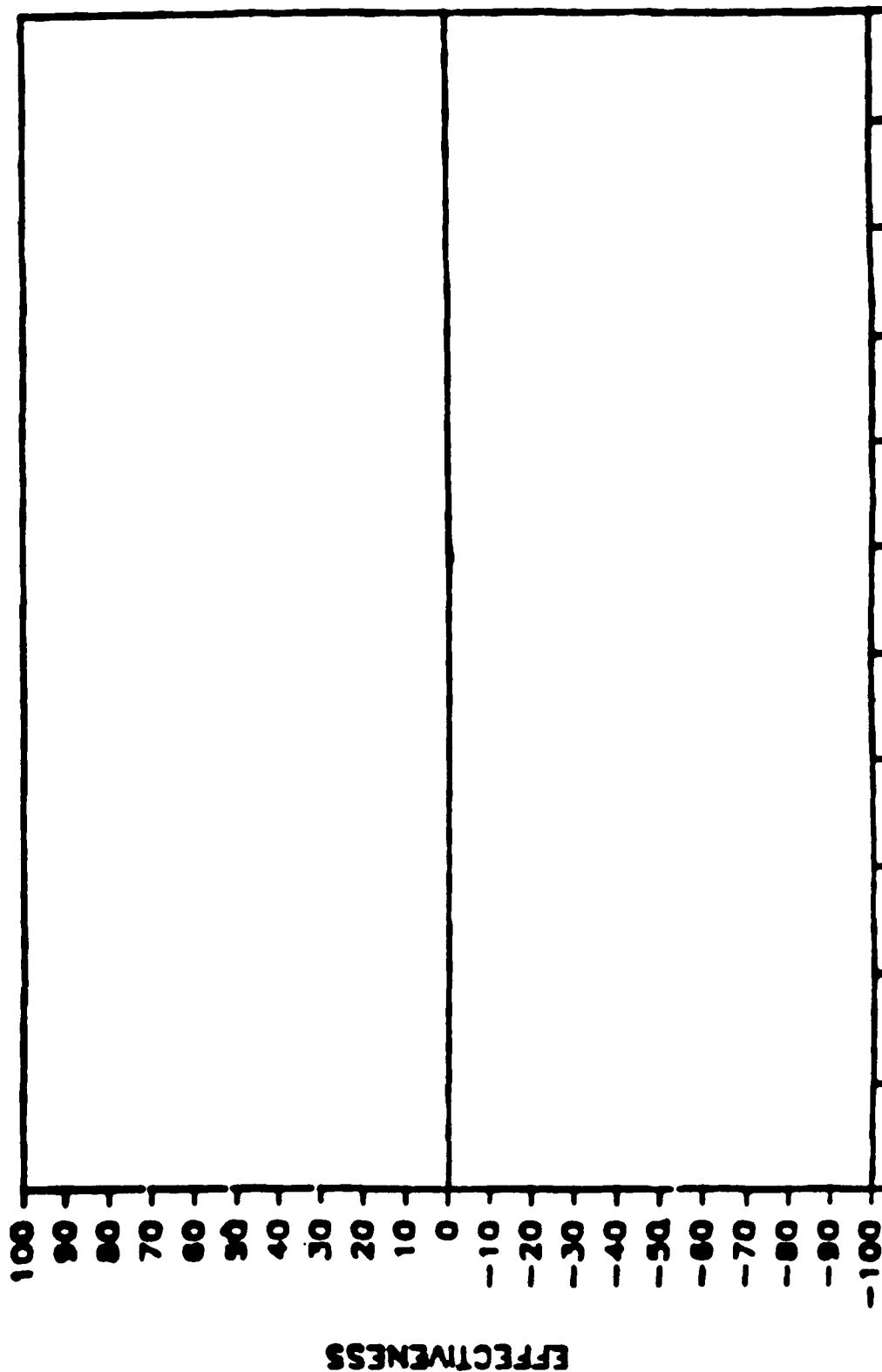


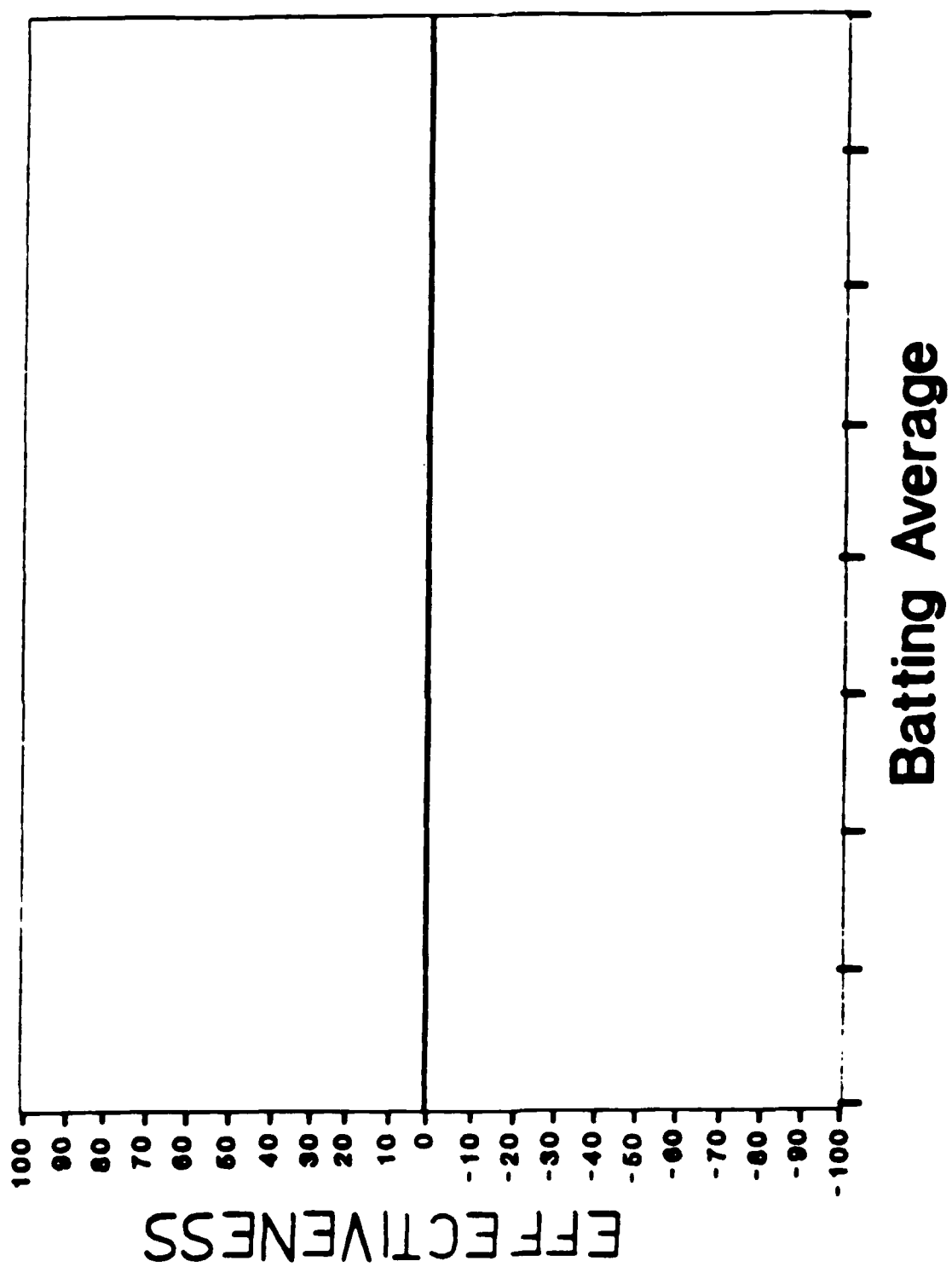
ADDITIONAL REQUIREMENTS

- IMPROVE MANAGEMENT TOOLS
- WEIGHT THE INDICATORS
- ROLL UP THE INDICATORS
- IMPLEMENT TQM



MISSION EFFECTIVENESS CHART

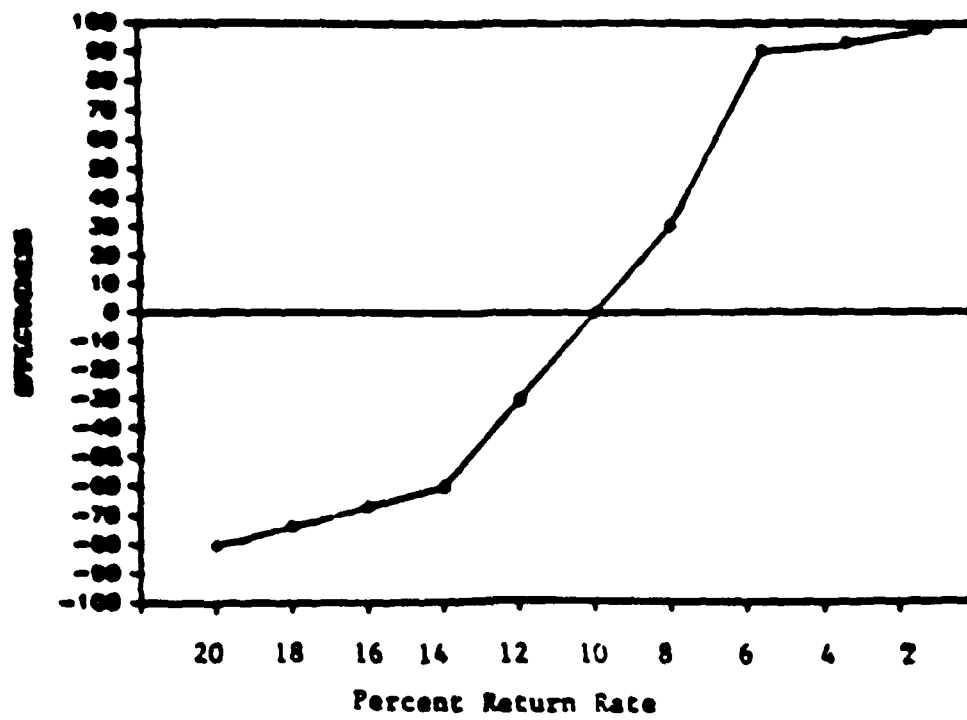
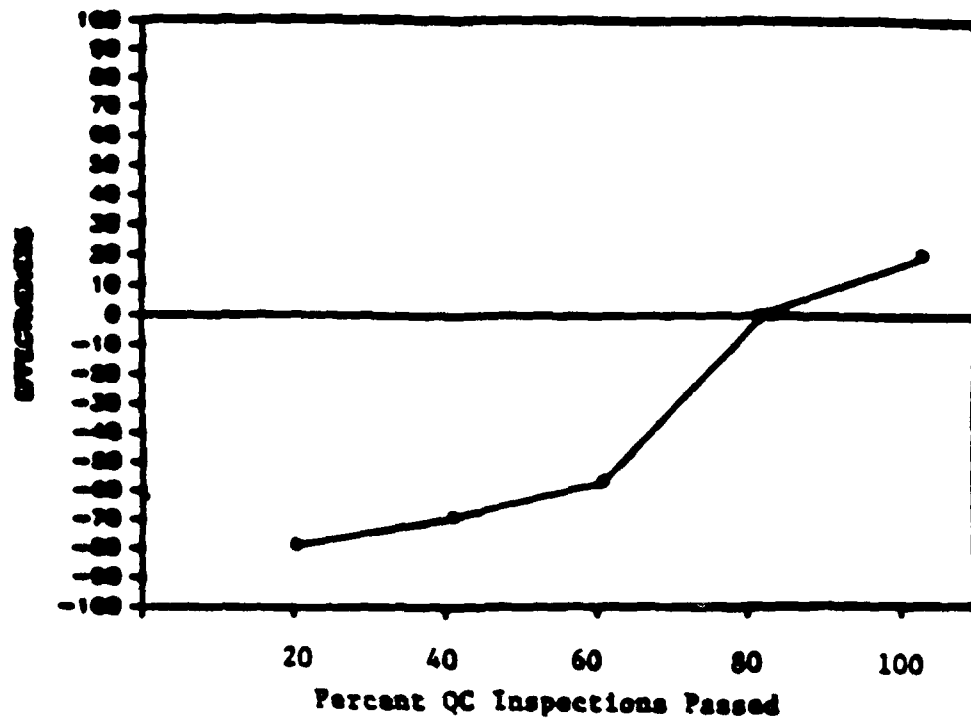






REPAIR SHOP MEASUREMENT SYSTEM

- KRA: QUALITY OF REPAIR
 - INDICATORS: A. % RETURN RATE
B. % QC INSPECTIONS PASSED



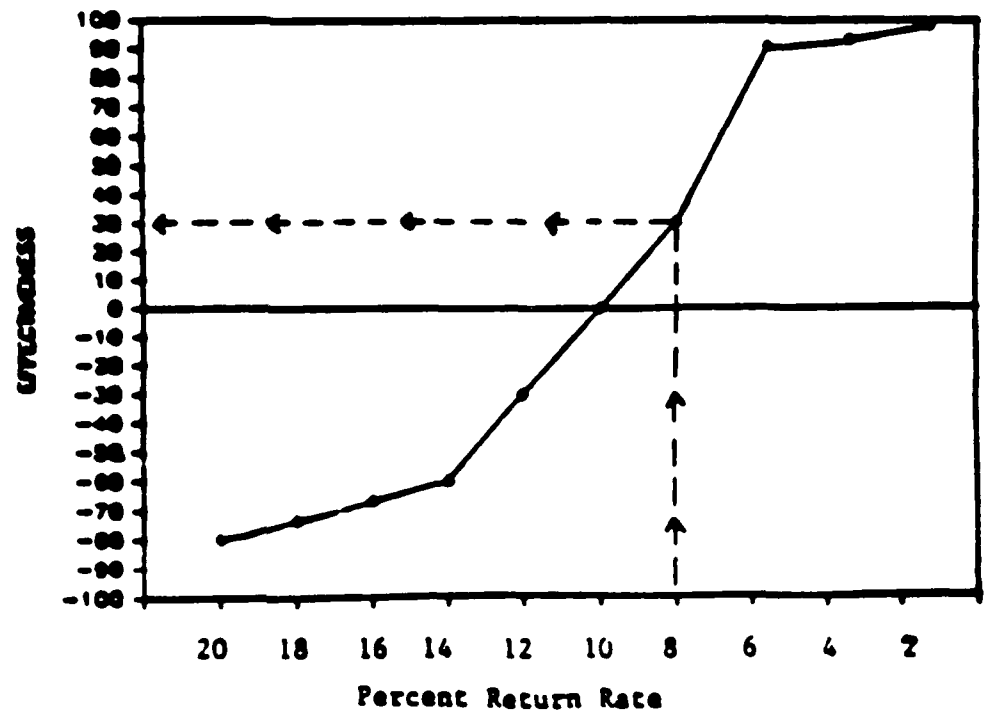
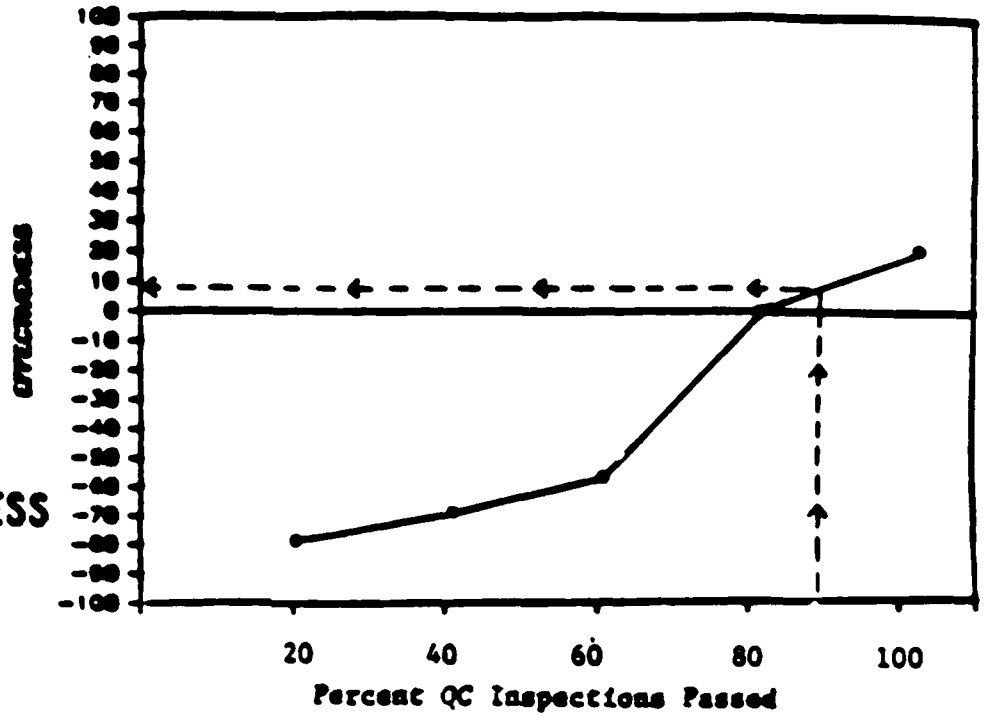
1D CUSTOMERS

INDICATOR DATA EFFECTIVENESS SCORE

90 → + 9

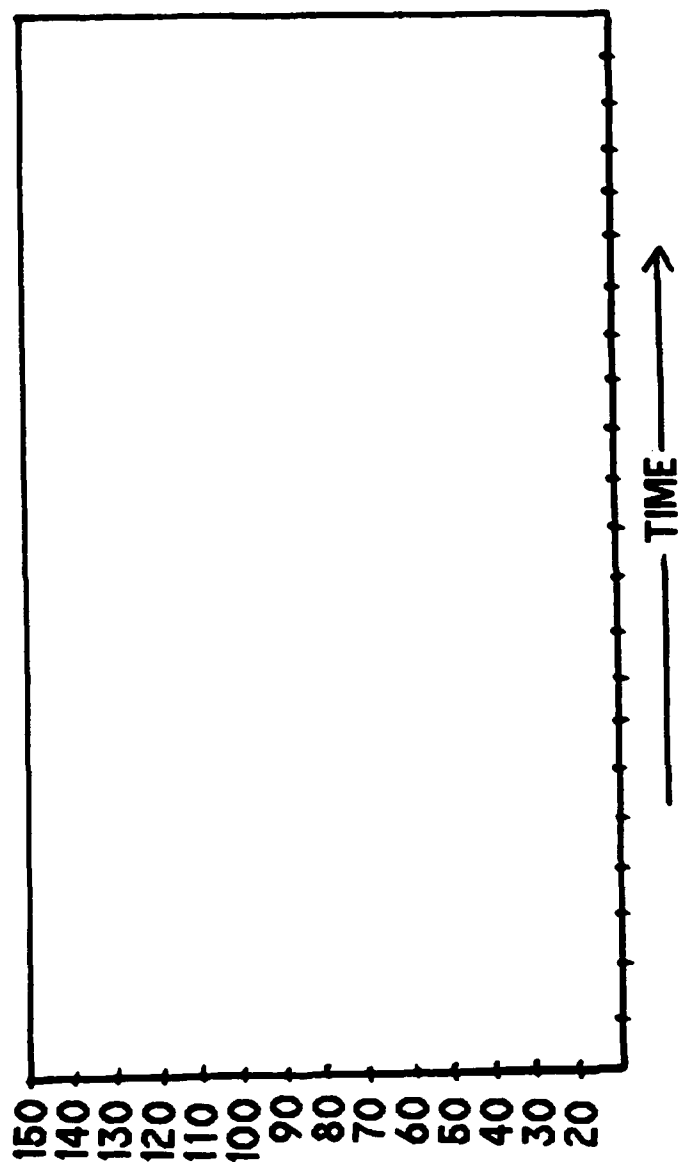
8 → + 30

 + 39





MEP FEEDBACK CHART





ADVANTAGES TO MANAGEMENT

- CLARIFIES THE MISSION
- IDENTIFIES KEY MISSION ELEMENTS (KRAs)
- MEASURES EACH KRA (INDICATORS)
- MEASURES OVERALL MISSION ACCOMPLISHMENT (ROLL UP)
- IDENTIFIES PRIORITIES FOR INCREASING PERFORMANCE
- HELPS ALLOCATE RESOURCES
- IDENTIFIES PROBLEMS BEFORE THEY BECOME SERIOUS
- SHOWS WHERE TO ASSIGN PATs
- SHOWS WHEN PROBLEMS ARE FIXED
- INVOLVES MIDDLE MANAGERS



MGEEM: PHASE FOUR

- **Feedback Sessions**
- **PATs**



WHAT IS A PROCESS?

- A SERIES OF SEQUENTIALLY ORIENTED, REPEATABLE OPERATIONS HAVING BOTH A BEGINNING AND AN END AND WHICH GENERATES EITHER A PRODUCT OR A SERVICE.

-- VIRTUALLY EVERY TASK IS PART OF A PROCESS
(DEVELOPING COMPANY POLICY, CREATING A PRODUCT OR SERVICE, MODIFYING A PROCESS/PRODUCT, OR ON-LINE PROCESS CONTROL.)

EXAMPLES OF PROCESSES

FOOD PREPARATION	PAYMENTS PROCESSING
METAL PLATING	CORPORATE TRAVEL
AUTOMOBILE ASSEMBLY	CUSTOMER BILLING
PAINTING A ROOM	PERSONNEL ACTIONS
PATIENT CARE	AIR TRANSPORTATION
PREPARING A MANUSCRIPT	REPAIRING A WASHER



THE SEVEN TOOLS

- FLOW CHART
- ISHIKAWA DIAGRAM
- PARETO CHART
- SCATTER DIAGRAM
- HISTOGRAM
- RUN CHART
- CONTROL CHART



TWO KINDS OF PATs

- FEEDBACK PATs
- CROSS-FUNCTIONAL PATs



CROSS-FUNCTIONAL PATS

- **REQUIREMENT**

- **MEMBERSHIP**

- AN ADVOCATE FROM THE QUALITY COUNCIL
- REPRESENTATIVES FROM THE FUNCTIONS INVOLVED
- A SUBJECT-MATTER EXPERT
- A PROJECT OFFICER

- **NOMINATIONS**

- FROM THE QUALITY COUNCIL
- FROM FEEDBACK PATS



THE MGEEM/TQM ORGANIZATION

- QUALITY COUNCIL PROVIDES DIRECTION/OVERSIGHT
- MISSIONS ARE UNDERSTOOD
- MISSION PERFORMANCE IS REGULARLY ACCESSED
- POWERFUL NEW MANAGEMENT TOOLS ARE IN USE
- SELF-CONTROL IS MAXIMIZED
- PATs IMPROVE KEY PROCESSES
- FOCUS IS ON
 - SATISFYING CUSTOMER EXPECTATION
 - COOPERATING WITH SUPPLIERS
- EFFORT IS LARGELY IN-HOUSE (IN DOD)



STEPS IN TQM IMPLEMENTATION

- 1. OBTAIN TRAINING MATERIALS**
- 2. CONDUCT DEMING AWARENESS TRAINING**
 - SENIOR MANAGERS
 - ALL OTHERS
- 3. ESTABLISH/TRAIN QUALITY COUNCIL**
- 4. IDENTIFY/TRAIN FACILITATORS**
 - MGEEM TRAINING
 - PAT TRAINING
- 5. PILOT TEST MGEEM**
- 6. IMPLEMENT MGEEM**
- 7. PROVIDE FACILITATOR ASSISTANCE, AS NEEDED**
 - MGEEM REVISIONS
 - PAT CONSULTATION
 - STATISTICS
- 8. ORIENT NEW MANAGERS/WORKERS**



POC

DR CHARLES N. WEAVER

AFHRL/MOMD

BROOKS AFB TX 78235-5601

AV 240-3551

AC 512 536-3551

APPENDIX B
MGEEM HANDOUTS

KRA, INDICATOR, ME CHART WORKSHEET

PERSONAL KEY RESULT AREAS:

KRA #1: _____

KRA #2: _____

KRA #3: _____

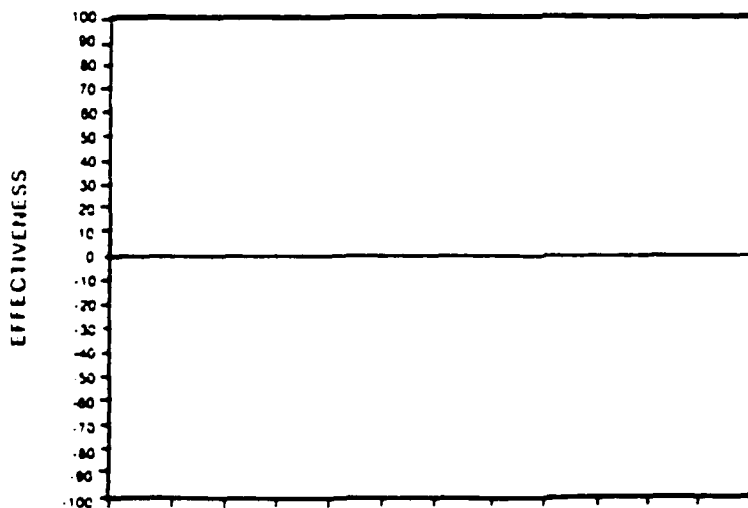
INDICATORS FOR KRA # _____ :

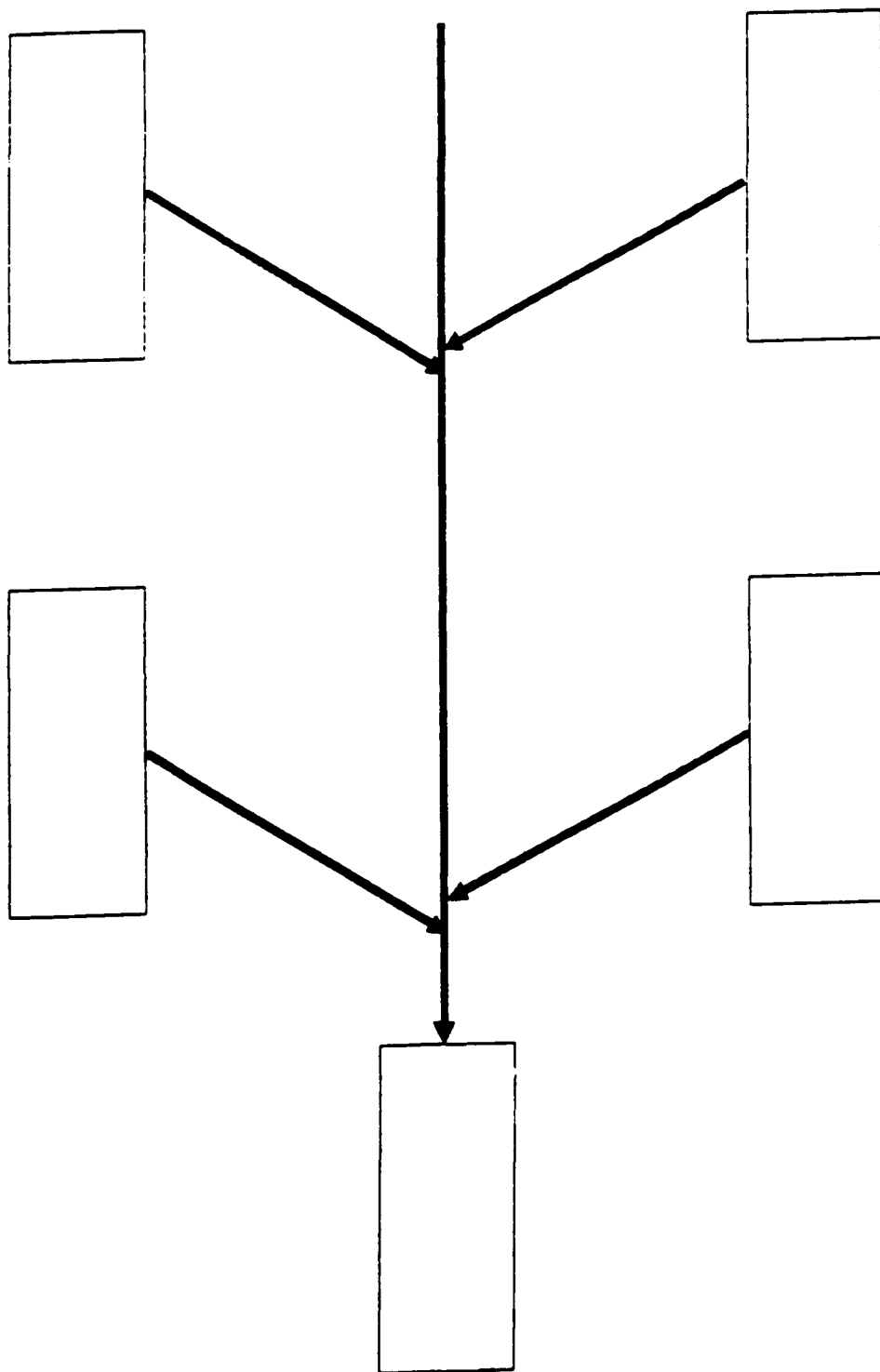
Indicator #1: _____

Indicator #2: _____

Indicator #3: _____

ME CHART FOR INDICATOR # _____ :





APPENDIX C
PROGRAM

LIBRARIES & TECHNOLOGY IN TRANSITION:
MEETING THE CHALLENGE

Program



33rd MILITARY LIBRARIANS WORKSHOP

SAN ANTONIO, TEXAS

18 - 20 OCTOBER 1989



HOSTED BY

**THE UNITED STATES AIR FORCE SCHOOL OF AEROSPACE MEDICINE
BROOKS AIR FORCE BASE, TEXAS**

Program



33rd
Military Librarians Workshop

LIBRARIES & TECHNOLOGY IN TRANSITION:
MEETING THE CHALLENGE

US Air Force School of Aerospace Medicine (AFSC)
Brooks Air Force Base, Texas

18-20 October 1989

Sheraton Gunter Hotel
San Antonio, Texas

Tuesday, 17 October 1989

1600-1800	MLW Executive Board Meeting	Jot Gunter Room
1600-1800	Registration	Mezzanine
1800-2000	Reception	Upper Muldoon's

Wednesday, 18 October 1989

0730-0830	Registration {continued} Continental breakfast	Mezzanine Gunter Terrace
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PLENARY SESSION

Bluebonnet/Magnolia Rooms

0830-0900	Welcoming Remarks Normand L. Varieur Chair, MLW Executive Board Chief, Scientific & Technical Information Branch US Army Armament Research & Development & Engineering Center Norman A. {Tony} Dakan Director, Air Force Library and Information System Fred W. Todd Chief, Technical Information Services Branch US Air Force School of Aerospace Medicine {AFSC}	
0900-0930	Introductory Remarks Colonel Dennis W. Jarvi Vice Commander, Human Systems Division {AFSC} Colonel George E. Schwender Commander, USAF School of Aerospace Medicine {AFSC}	
0930-1015	Welcome Address Dr George C. Mohr Acting Chief Scientist, Human Systems Division {AFSC}	
1015-1045	Coffee Break	Gunter Terrace

Keynote Address

Herbert S. Becker

Library of Congress

Lunch {On your own}

Keynote Address

Bluebonnet/Magnolia Rooms

Thomas W. Leonhardt

University of the Pacific

Refreshments

Gunter Terrace

Hypermedia: Interfacing in the Information Age

Dr J. Wesley Regian
AF Human Resources Laboratory (AFSC)

TEXAS ROUNDUP BARBECUE

Sheraton Gunter Hotel OK Corral

Thursday, 19 October 1989

CONCURRENT SESSIONS

Workshops: Technology Interfaces

Alamo Room

Barbara Greene Schomer

The University of

James J. Young

Baker Room

Mahncke Room

MARCIVE, Inc.

Coffee Break

Third Level

Workshops: Above sessions repeat

Lunch

Gunter Terrace/Bluebonnet/Magnolias

Speaker: Dr Jon French

US Air Force School of Aerospace Medicine (AFSC)

PLENARY SESSION

Bluebonnet/Magnolia Rooms

1400-1500 **Emerging Technologies**
James M. Erwin
Director of Technology
Defense Applied Information Technology Center

1500-1530 **Refreshments** Gunter Terrace

1530-1630 **New Options for Collection Analysis**
Ann Armbrister
Collection Analysis Systems Administrator
AMIGOS Bibliographic Council, Inc.

Dinner {on your own}

Friday, 20 October 1989

0700-0800 **Continental Breakfast** Gunter Terrace

PLENARY SESSION

Bluebonnet/Magnolia Rooms

0800-0930 **Total Quality Management**
Dr Charles N. Weaver
AF Human Resources Laboratory {AFSC}

0930-0945 **Coffee Break** Gunter Terrace

0945-1015 **FLICC Update**

1015-1100 **Service Updates {DOD, Air Force, Army, Navy, Canada}**

1100-1130 **SLA/MLD Business Meeting**
Barbara Fox
Chair, Military Librarians Division

1130-1145 **Closing Remarks**
Normand L. Varieur

WORKSHOP SPEAKERS

Ann Armbrister

Ann Armbrister is Collection Analysis Systems Administrator for AMIGOS Bibliographic Council, Inc. She has responsibility for marketing activities in support of OCLC/AMIGOS Collection Analysis Systems, a joint undertaking of OCLC Online Computer Library Center and AMIGOS. She has been a key participant in AMIGOS' development of a computerized collection analysis service based on library bibliographic tapes, and since 1988 has collaborated with OCLC developers of the compact disc system, Collection Analysis CD. Ms Armbrister has extensive experience in library automation, including acquisitions, cataloging and bibliographic database preparation. She holds a bachelor's degree from Duke University and an M.L.S. degree from the University of Oklahoma.

Herbert S. Becker

Herbert S. Becker was appointed Director, Information Technology Services (formerly known as the Automated Systems Office), Management Services, Library of Congress, in July 1985. He came to the Library with 18 years of government management experience concerned with the design, development, and implementation of information systems.

Mr Becker graduated with honors from Cornell University (B.A., 1954) and the University of Chicago (M.A., 1957) and has received a Bronze Medal for Superior Federal Service at the Department of Commerce, as well as other recognition for professional achievement. Entering government service as a budget analyst in the Navy Department in 1957, Mr Becker served first as Head, Financial Progress Reporting, and then as Assistant for Management Reporting Systems, Bureau of Naval Weapons. From 1962 to 1965 he served as Assistant to the Director of Management Services, then as Director, Office of Management Systems, Post Office Department.

In 1965, he became Director, Office of Program Planning and Analysis, Small Business Administration. In 1967 he applied data management and administrative skills to the Economic Development Administration. In 1979 he became Assistant Director of Planning, Budget and Evaluation, Minority Business Development Agency. He was named to his position as Director of Advocacy, Research and Information in the Minority Business Development Agency in 1981.

As Director of the Information Technology Services, Mr Becker manages an office which is responsible for research, development, and operational management of the combination of hardware and software systems that best supports the Library in its many missions. He is currently involved in directing development of major new systems using new technologies for the Library of Congress.

Virginia Bowden

Virginia Bowden is Director of the Dolph Briscoe Library of The University of Texas Health Science Center at San Antonio. She received a B.A. degree in mathematics from The University of Texas at Austin and an M.S.L.S. from the University of Kentucky. She is completing the course work for a Ph.D. in Library and Information Science at The University of Texas at Austin. Ms Bowden has been involved with automation in industry, non-profit corporations, and libraries for many years.

Jon French

Dr Jon French was trained as a physiological psychologist at Colorado State University where he studied the electrophysiology of learning and memory. During post-doctoral training in the Department of Neurology at Cornell University Medical School, Dr French examined the neuropathologic consequences of brain cell dysfunction during hypoglycemia and stroke. As a research scientist in the Department of Pharmacology at the Warner-Lambert Pharmaceutical Company, Dr French was engaged in testing anti-Alzheimer's agents. There he supervised the electroencephalographic tests for all new compounds in the cognition activator program. Dr French was also involved in evaluating human cognitive impairment produced by benzodiazepines as an associate at the University of Michigan.

Although he has been with the US Air Force School of Aerospace Medicine for only 13 months, as a research physiologist, Dr French has been the principal investigator on two major projects for the Crew Technology Division and contributed to other research projects at Brooks and other Air Force bases.

Thomas W. Leonhardt

Tom Leonhardt received the M.L.S. degree from the University of California at Berkeley in 1973, the year he began his career as head of the Gifts and Exchange Division of the Stanford University Libraries. He also served as head of acquisitions at Boise State University and Duke University before becoming the Assistant University Librarian for Technical Services at the University of Oregon in 1982. He was appointed Dean of Libraries at the University of the Pacific in 1987. He is the past editor of the RTSD Newsletter and the incoming editor of Information Technology and Libraries, the scholarly quarterly of the Library and Information Technology Association. He is the author of numerous articles on technical services and collection development and has spoken at library conferences and meetings throughout the country. He has served on several editorial boards and is currently editor of the JAI Press series Foundations in Library and Information Science.

Janifer Meldrum

Janifer Meldrum is the Director of Marketing for MARCIVE, Inc., a company which provides a wide range of bibliographic services and products including cataloging services through CENCARD and CD-ROM services through FEDLINK. She earned the master's degree in librarianship from Emory University in Atlanta. Her library experience includes five years at the Georgia Tech Library, first in government documents, then in cataloging, database maintenance, and authority work. She worked with an integrated library system vendor for five years before joining MARCIVE. For the past three years, she has been part of the design team for the company's CD-ROM products.

George C. Mohr

Dr George C. Mohr is the Acting Chief Scientist in the Directorate of Science, Technology and Operational Aeromedical Support, Headquarters, Human Systems Division (HSD), Air Force Systems Command, Brooks Air Force Base, Texas. He is responsible for providing consultative and advisory service to the Program Director, Science, Technology and Operational Aeromedical Support and his staff on the technical and scientific aspects of HSD programs. He serves as an adjunct advisor to the Commander on science and technology issues related to HSD's total mission.

Dr Mohr received a bachelor of arts degree in biology and chemistry from Luther College, Decorah, Iowa, in 1951. He was a Rhodes Scholar at Hertford College, University of Oxford, England, and earned a bachelor of arts {Oxon} degree from the Honour School of Animal Physiology in July 1954, specializing in neurophysiology and biochemistry. He accepted a direct commission as a second lieutenant in the U.S. Air Force Medical Service Corps in 1956 and graduated from Harvard Medical School, Boston, Massachusetts, in 1957. He received a master of public health degree in aerospace medicine at the Harvard School of Public Health in 1961. He completed the Advanced Course in Aerospace Medicine at the U.S. Air Force School of Aerospace Medicine, Brooks Air Force Base, Texas, in 1962, leading to certification by the American Board of Preventive Medicine in Aerospace Medicine in 1965.

Most of his active duty career was with the Air Force Systems Command. In June 1975 Dr Mohr was appointed Director, Research and Development, at the Headquarters, Aerospace Medical Division, at Brooks Air Force Base, Texas. In 1979 he became Vice Commander of the Aerospace Medical Division, and in 1980 he assumed Command of the Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio. Before his military retirement in 1983, he was the Deputy for Crew Systems Integration and Human Resources in the Headquarters, Human Systems Division.

J. Wesley Regian

Dr J. Wesley Regian is the Senior Scientist for the Intelligent Systems Branch of the Training Systems Division. He entered civil service in 1987 as Function Chief of Intelligent Systems Evaluation for the Intelligent Systems Branch. Dr Regian has been an active researcher for over eight years in university and government laboratories. He has published and presented papers on human learning and memory, individual and developmental differences in human cognition, spatial ability and spatial information processing, cognitive modeling, skill acquisition, componential analysis of spatial tasks, development of automaticity, psychometrics, artificial intelligence, hypertext, hypermedia, training, and computer-based training.

His academic degrees include an associate of arts and sciences in psychology from Richland College, a bachelor of arts in psychology and English from the University of Texas at Dallas, a master of science in human development from the University of Texas at Dallas, and a doctorate in cognitive-experimental psychology from the University of California at Santa Barbara. Dr Regian holds Secondary Teaching Certification for the State of Texas. He has taught psychology and English at the high school level, and social psychology, graduate statistics, advanced graduate statistics, experimental design, human memory, and psychology at the college level.

Barbara G. Schomer

Ms Barbara G. Schomer is the Assistant Library Director for Instructional Services at the Briscoe Library, The University of Texas Health Science Center at San Antonio. She holds an M.L.S. from The University of Texas at Austin, where she has taught classes on media collections for the Graduate School of Library and Information Science. Ms Schomer has worked with microcomputers in a public use area, the library's Teaching Learning Center, since 1981, and with a local area network for public use since 1988. She is responsible for the library's instructional programs, media services, and microcomputer lab. Presentations and publications range from: Computer-Based Educational Programs in a Teaching Learning Center: A Study in Cooperation to "The Library as an Information Resource" in Information Sources for Nursing, A Guide.

Sallieann Swanner

Sallieann Swanner is the Assistant Library Director for Systems and Technical Services at The University of Texas Health Science Center at San Antonio. She has an M.L.S. from The University of Texas at Austin.

Ms Swanner has a varied and progressive background in library automation. Currently she manages the BLIS information system which includes the basic library functions such as the online catalog, circulation, and serials control plus two information databases: miniMEDLINE, a subset of MEDLINE and Micromedex, a full text drug information database. Her experience includes installation of an integrated library system; management of the library computer services budget and computer hardware maintenance contracts; and the expansion of BLIS from PDP environment to a VAX one. Her work experience includes positions in acquisitions, cataloging and reference in medical, academic libraries and public libraries.

Charles N. Weaver

Dr Charles N. Weaver graduated in 1958 (B.B.A. in Controllorship Management) and 1959 (M.B.A. in Management and Marketing) from Southern Methodist University and in 1967 (Ph.D. in Management, Marketing, and Sociology) from The University of Texas at Austin. He taught business administration in 1961-1963 at Pan American University and has been on the faculty at the School of Business and Administration at St Mary's University since 1964. He currently holds a professorial chair at St Mary's University where he is Emil C.E. Juria Professor of Quantitative Management. He has been affiliated with the Air Force Human Resources Laboratory (AFHRL) since 1979 where he has been involved in research and development (R&D) programs in job satisfaction, attrition, retention, and job performance measurement. Currently, he is involved in the R&D program in measuring and enhancing organization performance. He has written extensively for magazines and scholarly journals, presented numerous research papers at conventions, and authored a number of AFHRL technical reports. He currently provides technical assistance to the Air Force Management Engineering Agency (AFMEA) in making available to all Air Force functional areas a powerful new management information system used to measure organizational performance and implement Total Quality Management (TQM).

James J. Young

Jim Young is President and co-founder of Sirsi Corporation, a library automation firm established in Huntsville, Alabama, in 1979. Mr Young founded Sirsi on a broad base of computer experience in database and project management in private industry and a three-year term as Manager of the Systems and Database Department at the Georgia Institute of Technology Library. He designed and directed the implementation of a large-scale database management system to produce microfiche copies of the library's catalog and provided consulting services to other libraries and library networks. Sirsi Corporation develops and markets UNIX and XENIX-based library automation products, turnkey or software-only, with a focus on information management, distribution and retrieval. Mr Young has a B.Sc. in Mathematics and an M.Sc. in Computer Science.

ACKNOWLEDGEMENTS

Sponsor: Special Libraries Association, Military Librarians Division

Host: Human Systems Division (AFSC)
US Air Force School of Aerospace Medicine
Brooks Air Force Base, Texas

Major General Frederic F. Doppelt
Commander, HQ HSD

Colonel George E. Schwender
Commander, USAFSAM

William Glisson
Chief, Technical Services Division

Fred W. Todd
Chief, Technical Information Services Branch/
Library Director

Program Committee:

Fred W. Todd, Chair
US Air Force School of Aerospace Medicine

Norman (Tony) Dakan, Co-Chair
Air Force Library and Information System

Orrine Woinowsk, Co-Chair
AF Human Resources Laboratory

Registration:

Dewey A. Goff, Jr., Chair
Marilyn M. Goff, Co-Chair
US Air Force School of Aerospace Medicine

Proceedings:

Marion E. Green
US Air Force School of Aerospace Medicine

Local Planning:

Fred W. Todd, Chair
Joseph J. Franzello
Dewey A. Goff, Jr.
Marilyn M. Goff
Duane Johnson
Ann R. Potter
Orrine Woinowsk

Special thanks to Paul J. Oshipko, US Air Force School of Aerospace Medicine

MLM Executive Board:

Normand Varieur, Chair
Norman {Tony} Dakan {Air Force}
Judith Arnn {Army}
Barbara Everidge {DOD}
Kathy Wright {Navy}
Barbara Fox, Chair, MLD
Jennifer Doran, Treasurer, MLD {Ex-officio}
Kathryn Marshall, Immediate Past Chair, MLD {Ex-officio}
Paul Klinefelter, Parliamentarian {Ex-officio}

THE MILITARY LIBRARIANS WORKSHOPS

<u>MLW</u>	<u>Year</u>	<u>Dates</u>	<u>Host</u>
1st	1957	21-23 Oct	Air University Maxwell AFB, AL
2nd	1958	2-4 Oct	Army Artillery and Missile Center, Fort Sill, OK
3rd	1959	8-10 Oct	Naval Postgraduate School Monterey, CA
4th	1960	7-9 Oct	Armed Services Technical Information Agency Washington, DC
5th	1961	4-6 Oct	U.S. Air Force Academy Colorado Springs, CO
6th	1962	26-28 Sep	White Sands Missile Range White Sands, NM
7th	1963	2-4 Oct	Naval Ordnance Laboratory Silver Spring, MD
8th	1964	14-16 Oct	Air Force Weapons Laboratory Albuquerque, NM
9th	1965	3-5 Nov	U.S. Military Academy West Point, NY

<u>MLW</u>	<u>Year</u>	<u>Dates</u>	<u>Host</u>
10th	1966	12-14 Oct	Naval Electronics Laboratory San Diego, CA
11th	1967	31 Oct- 2 Nov	A.F. Institute of Technology Wright-Patterson AFB, OH
12th	1968	30 Sep- 2 Oct	U.S. Army War College Carlisle Barracks, PA
13th	1969	29 Sep- 1 Oct	U.S. Navy War College Newport, RI
14th	1970	30 Nov- 2 Dec	Industrial College of the Armed Forces Washington, DC
15th	1971	4-6 Oct	HQ, U.S. Air Force San Antonio, TX
16th	1972	2-4 Oct	Redstone Scientific Information Center Redstone Arsenal, AL
17th	1973	9-12 Sep	Naval Research Laboratory Washington, DC
18th	1974	10-12 Sep	HQ, U.S. Army Communications Command Fort Huachuca, AZ

<u>MLW</u>	<u>Year</u>	<u>Dates</u>	<u>Host</u>
19th	1975	30 Sep- 2 Oct	U.S. Air Force Academy Colorado Springs, CO
20th	1976	20-22 Oct	U.S. Naval Academy Annapolis, MD
21st	1977	27-29 Sep	U.S. Army War College/ Army Military History Inst. Carlisle Barracks, PA
22nd	1978	31 Oct- 2 Nov	Air Force Weapons Lab Albuquerque, NM
23rd	1979	3-5 Oct	Defense Documentation Center, Alexandria, VA
24th	1980	15-17 Oct	Naval Postgraduate School Monterey, CA
25th	1981	14-16 Oct	Air University Maxwell AFB, AL
26th	1982	13-15 Oct	U.S. Military Academy West Point, NY
27th	1983	12-14 Oct	Defense Nuclear Agency Washington, DC
28th	1984	17-19 Oct	Naval Coastal Systems Center, Panama City, FL

<u>MLW</u>	<u>Year</u>	<u>Dates</u>	<u>Host</u>
29th	1985	9-11 Oct	U.S. Air Force Academy Colorado Springs, CO
30th	1986	15-17 Oct	U.S. Army Corps of Engrs New Orleans, LA
31st	1987	20-23 Oct	Defense Intelligence Agency Washington, DC
32nd	1988	12-14 Oct	Naval Ocean Systems Center San Diego, CA
33rd	1989	18-20 Oct	Air Force School of Aerospace Medicine San Antonio, TX

FORTHCOMING HOSTS

34th	1990		U.S. Army Training and Doctrine Command Fort Monroe, VA
35th	1991		Defense Language Institute Monterey, CA
36th	1992		Naval Underwater Systems Center New London, CT
37th	1993		Air Force Weapons Laboratory Albuquerque, NM
38th	1994		(Army) Picatinny Arsenal

APPENDIX D
ATTENDEES

**LIBRARIES & TECHNOLOGY IN TRANSITION:
MEETING THE CHALLENGE**

Attendees



33rd MILITARY LIBRARIANS WORKSHOP

SAN ANTONIO, TEXAS

18 - 20 OCTOBER 1989



HOSTED BY

THE UNITED STATES AIR FORCE SCHOOL OF AEROSPACE MEDICINE

BROOKS AIR FORCE BASE, TEXAS

Attendees



As of 10 Oct 89

33rd MLW - Listing of Attendees
10 Oct 89

Mary Aldous
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Wilkins Biomedical Library
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HQ TRADOC Test & Experimentation Ctr
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Delores R. Allen
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Redstone Arsenal AL 35898-5000
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Concetta R. Anacletio
Chemical Research, Dev & Eng Ctr
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Hattie T. Anderson
Johns Hopkins University
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Mary N. Barravecchia
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Chief, Library Branch
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33rd MLJ - Listing of Attendees
10 Oct 89

Jacqueline S. Bey
US Army Technical Ctr for Explosives Safety
Attn: SMCAC-ESM {Technical Library}
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James H. Byrn, Command Librarian
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Bobbie Carr
Dudley Knox Library
Naval Postgraduate School
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33rd MLW - Listing of Attendees
10 Oct 89

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Harriet Cohen
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Frances Quinn Deel, Command Librarian
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Alice Granor
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Alreeta Eidson
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33rd MLW - Listing of Attendees
10 Oct 89

Garth Elmore
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